

OCTOBER 1960

DATA **PROCESSING**[®]

THE MAGAZINE OF AUTOMATIC OFFICE METHODS AND MANAGEMENT



COMMON BUSINESS ORIENTED LANGUAGE

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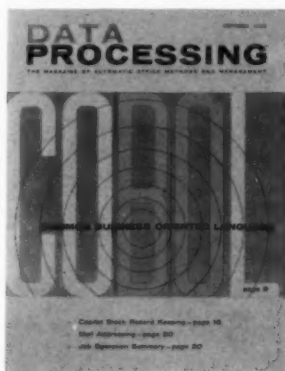
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Bendix Computer Division
DEPT. I-27 LOS ANGELES 45, CALIF.



DATA PROCESSING

Volume Two • Number Nine



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Published monthly by
GILLE ASSOCIATES, INC.
22nd Floor Book Tower
Detroit 26, Michigan
WOodward 2-8040

EDITORIAL AND CIRCULATION OFFICES

22nd Floor Book Tower
Detroit 26, Michigan
WOodward 2-8040

ADVERTISING OFFICES

MAIN OFFICE

22nd Floor Book Tower
Detroit 26, Michigan
WOodward 2-8040

520 Fifth Ave. New York 36, N. Y. YUkon 6-5352	420 Market St. San Francisco 11, Calif. DOuglas 2-3899
1417 Georgia St. Los Angeles 15, Calif. RiChmond 7-6561	333 N. Michigan Ave. Chicago 1, Ill. FRanklin 2-7100

Subscription rate \$7.50 per year, United States and possessions and Canada; other countries \$8.50 per year. Single copy 75c when available.

Send subscription correspondence and change of address to Gille Associates, Inc., 22nd Floor Book Tower, Detroit 26, Mich. Subscribers should notify publisher promptly of any change of address, giving old and new addresses, including city postal delivery zone. If possible, enclose address label from recent issue of magazine. Allow six weeks for change to become effective.

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Also publishers of The Punched Card DATA PROCESSING Annual (Applications Volumes and Reference Guide) and Data Processing Handbooks. Second class postage paid at Detroit, Michigan.

OBSERVATIONS . . . from the publisher . . .

WHILE MANAGEMENT ENDEAVORS to keep pace with the rapidly increasing volumes of paperwork in corporate operations, it is challenged further to keep abreast with data concerning data processing.

In a recent conversation, the sales promotion manager of a leading equipment manufacturer noted that only three years ago in developing a bibliography of published material there was woefully little to be found. Not so today. In compiling the bibliographical index to periodical articles for the latest edition of The Punched Card Data Processing Annual we discovered that 104 periodicals include data processing information with some regularity. This index includes references to 578 articles written by 492 authors. The references to subject material in this index could have been increased fivefold or perhaps even tenfold by a more detailed indexing of every subject dealt with in each article. However, even the primary subject references suggest the substantial volume of information that has appeared in periodicals.

For a management man to get the greatest benefit from available information we believe it is necessary that he have a planned information program. He cannot hope to read all the available material nor could he retain all the information if he did. A planned information program would include a regular review of new developments limited only to that basic information that can be readily retained; intercourse with other management men having similar information needs; training in those specific areas where a depth of knowledge is needed quickly and the acquisition of a detailed reference library that will permit access to a large quantity of information when needed.

Our publishing operations are geared to a planned program of this type by supplying you with several varieties of information media, each cognizant of the content of the other. We hope to help you fulfill a major portion of your information plan. A number of new services are under development, each designed to assist you in making the most effective evaluation of your data processing operations on a continuing basis. The primary emphasis in this development is on its practicality in use and the quality of content.

Most recently announced is the Data Processing EQUIPMENT ENCYCLOPEDIA. This new service will, for the first time, put detailed equipment data at your fingertips. It will include both electromechanical and electronic devices useful in both the small and large offices. Regular supplements will keep this information up to date.

This is one more in our family of information services designed to foster a more effective use of modern data processing systems.

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"The Burroughs 220 Computer is a Potent Tool in Advancing Our Technology?"

Dr. Charles D. Alstad, Acting Director, Computations Research Laboratory, The Dow Chemical Company

Why do it? There are many common denominators between the global Dow of 1960 and the infant Dow of 1897. Perhaps the most important one is a business philosophy stated by founder Herbert Henry Dow. He put it this simply: "If you can't do a thing better than it's already being done, why do it?"

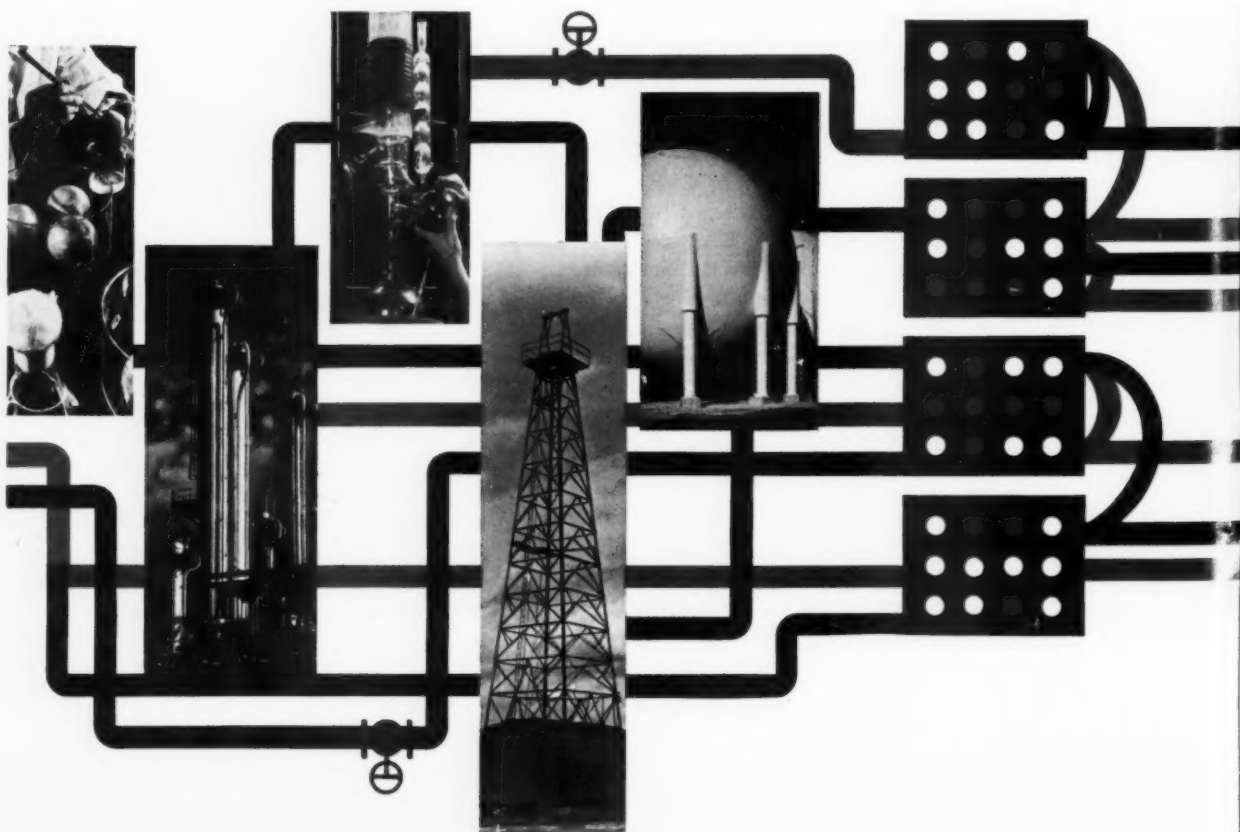
Under this pervading philosophy, Dow places heavy emphasis on new product research and operations research. And to help push advances in these areas farther and faster at less cost, Dow uses a Burroughs 220 Computer System.

THE BURROUGHS 220 AT DOW

This 220 system consists of the data processor with 5,000-word core storage, two supervisory printers, photo-reader, two paper tape punches, three magnetic tape storage units, and a Cardatron sub-system for controlling punched card input and output. Selected for its greater capacity and speed, the 220 is one of two Burroughs Computers at Dow. The other: a Burroughs 205 Computer at Dow's Freeport, Texas, operation.

The 220 computer is at work in Dow's Computations Research Laboratory in Midland, Michigan, headquarters for the firm. As Acting Director Dr. Charles D. Alstad puts it, "Our use of the 220 is in scientific and engineering applications, where it is an important adjunct to all the scientific talents available at Dow."

Super screener. For example, Dow uses the computer as a screening tool in the development of higher energy solid rocket fuels under its contract with the Advanced Research Projects Agency. In pursuit of project goals, Dow chemists can envision many fuel combinations. But they can't, of course, subject each combination to exhaustive laboratory tests. Through the Burroughs 220, Dow gets all data necessary for preliminary evaluation of a fuel and gets it in anywhere from two minutes to a half hour. In this way, Dow scientists can select only the most promising combinations for laboratory evaluation, development and testing.



Turbine tamer. In another application, Dow uses the 220 in calculating turbine efficiency tests. The calculations, which were formerly performed by hand, took at least two weeks but now require less than five minutes on the computer.

Designing for profit. Plant design is another function of the 220. In today's hotly competitive chemical industry, it's essential to keep the cost per pound of product minimized. Consequently, a plant must be carefully designed for a specified capacity, minimum capital investment, and efficient operation. The computer is a useful tool in striving for these objectives.

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Dr. Charles D. Alstad

Masterminding molecules.

The 220 at Dow is busy in pure research, too, where it is helping to advance the frontiers of science. For instance, Dow is investigating the bonding forces and links between the atoms in a molecule. And the Burroughs 220 performs the Urey-Bradley Force Constants Calculations that are required. These studies will supply the knowledge which will allow Dow scientists to make predictions on

how a given chemical will behave in a reaction.

Long and short of it. There are many other aspects of the 220's work at Dow, such as its evaluation of pilot plant projects, information retrieval and other routine mathematical calculations. "Fundamentally," says Dr. Alstad, "our

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Computer Operator Ray L. Haeusler at console of 220

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COBOL

COMMON BUSINESS ORIENTED LANGUAGE

Computer Language of the Future

THE NEW GENERATION OF COMPUTERS, those announced in the past year or two and being delivered in the not-too-distant future, may present to their users still greater economies than are apparent through inspection of their prices and speeds. The cost of setting up and checking out computer programs should be significantly reduced through the use of those assemblies and compilers being offered by the manufacturers for their machines. And if the manufacturers offer compilers in the

form of COBOL, as some do, the savings may be even greater.

COBOL, the Common Business Oriented Language fostered by the Department of Defense, is the first large scale attempt at a common language for all computers which can be read and understood by humans. The desirability of a common language had always been apparent; ease of transfer from one machine system to another is the biggest advantage. Other areas of value are in minimizing the training required of new personnel and the possible establishment of standards of training and accomplishment, the simplifying of the ever-present changes in programs brought about by new management requirements, and the freeing of the program from the computer's language, thus making it possible for persons with no computer training to understand, at least in part, what is happening.

The success of COBOL, both immediate and ultimate, depends first upon the specifications for the common language, and second upon the computer manufacturers. If the language is *capable* of being converted into *efficient* computer instructions and is well-enough defined to handle all situations, the specifications are satisfactory; the manufacturers then have the task of writing compilers and processors to translate COBOL to the languages of their particular machines.

(continued on next page)

By John H. DeJong



A compiler is a program-making routine which uses certain key words and symbols to select or generate the specific coding required to accomplish a process defined in terms of the key words; it is our highest form of automatic programming.

How it started

The Department of Defense started the COBOL project in May, 1959, by calling a meeting of representatives of computer manufacturers, government installations, and other major computer users. The purpose of the meeting was to consider the feasibility of a common language for programming computers in business-type data processing problems. The organizations participating in this meeting were:

Air Materiel Command, U. S. Air Force
Bureau of Standards, Department of Commerce
Computer Science Corporation
Datamatic Division, Minneapolis-Honeywell Corporation
David Taylor Model Basin, Bureau of Ships, U. S. Navy
ElectroData Division, Burroughs Corporation
International Business Machines Corporation
Radio Corporation of America
Remington Rand Division of Sperry Rand, Inc.
Sylvania Electric Products, Inc.

This Conference on Data Systems Language (CODASYL), after agreeing on the feasibility of the project, established three committees, short range, intermediate range, and long range, to implement the common language. An executive committee was also set up to review and control all work. The short range group was given the responsibility of investigating the strengths and weaknesses in existing compilers and from this study to design a workable system in the first year. The intermediate range group was to continue where the first group left off and develop a systems-oriented language by the end of 1961. The long range group was to define independently what should ultimately be desired in a common language for both business and scientific use.

In the first three months after its formation, the short range group held over a dozen meetings. Its members, representatives of six manufacturers and three government agencies, submitted their final report to the CODASYL executive committee in December, 1959; this report contained the initial specifications for the common machine language they wished to have called COBOL. The executive committee approved the report and set up the original printing of the specifications. This report entitled *COBOL*, may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 75 cents.

General description

COBOL is composed of two elements: the source program written in COBOL and the compiler which translates the common language statements of COBOL into an object program capable of running on a computer. The source program, used to specify the solution of a business data processing problem, is composed of three elements: 1) the set of procedures which determines how the data is to be

processed, called the *procedure division*; 2) the description of the data being processed, called the *data division*; 3) the description of the equipment being used in the procession, called the *environment division*.

The *procedure division* specifies the steps that the programmer wishes to have the computer do. These steps are expressed in English words and statements; the statements or sentences can be meaningful to anyone reading them. Certain verbs denote actions, nouns with or without adjectives refer to quantities; logical choices are made in *if—then* statements. Of the three divisions, this one is the most computer-independent; that is, the *procedure division* would be least affected if one were to change from one type computer to another, since every COBOL compiler will interpret this information in the same way. Because the program statements often refer to the *data division*, a change in computers requiring a restatement of the *data division* may affect the *procedure division*, hence this division is not entirely independent of the computer.

The *data division* uses file and record descriptions to define the configuration of the data which the program is to use and to create. Few of the physical characteristics of the files (*magnetic tape, cards, etc.*) are included in the *data division* descriptions, so this division is to a high degree computer-independent. While compatibility among computers cannot be assured, careful planning may allow the same data descriptions to apply to more than one computer.

The *environment division* describes both the computer being used in compiling the COBOL source program, and the computer on which the object program is to be run. Memory size, input-output units, hardware switches, etc., are among the elements of the *environment division*. Those aspects of a file which relate directly to the hardware must be described here; problem oriented names may be assigned to pieces of equipment. Except for the particular problem-oriented features, the *environment division* is entirely computer dependent. For the most part, then, one statement of the environment will suffice for all COBOL programs being processed on a particular computer.

A word in COBOL is composed of not more than 30 characters chosen from the allowable set A through Z, 0 through 9, and the hyphen or minus sign; a special character or a space is used to end the word. Words can be *nouns* describing data and procedures, a select set of *verbs* denoting some action to the COBOL compilers, or *reserved words*. These include optional words which improve readability but do not affect the compiling (*as AT, THAN, WITH*), connectives to define qualifiers or subscripts (*such as IN, OF*), and some key words needed in particular formats. Qualifiers are required to make every noun in a COBOL program



unique. If the word DATE is found in both the master file and the current activity file, for example, reference to the former date must be made by MASTER FILE DATE or DATE IN MASTER FILE to qualify which DATE was referenced. Subscripting is limited to three levels in COBOL, major, intermediate, and minor.

Nouns can be of several types: data names designate fields specified in the data description; a condition is a name assigned to a value which a field may assume. (For example, consider a conditional variable called SEX. If condition-names MALE and FEMALE are assigned the values 1 and 2 respectively, the conditional expression IF FEMALE THEN . . . would cause the field SEX to be tested against the value "2"). Literals for headings and comments are placed in quotation marks; special names are used to relate the machine hardware to problem-oriented names.

How it works

The programmer working on a business data processing problem in COBOL must specify the information for each of the three divisions; each division has a prescribed format and a set of key words which are to be used. The format is quite strict in the *environment division*, somewhat less restrictive in the *data division*, and very loose in the *procedure division*; in fact, the procedural statements read very much like English prose.

The object of the *environment division* is to define those aspects of a data processing problem which are dependent upon the physical characteristics of a specific computer. The division has been given two sections, *configuration* and *input-output*. In the *configuration* section, definitions are given: 1) to the source computer, the computer on which the COBOL compiler is to be run; 2) the object computer, the equipment on which the object program is to be run; and 3) any special names needed to relate the actual names of the hardware used by the COBOL compiler to the names used in the program. The *input-output* section gives the programmer the chance to specify the manner in which the

data is to be handled, such as establishing input-output techniques, rerun points, memory areas which are to be shared by different files, and the location of files on a multiple file reel.

In the *data division*, the object is to define all data names used in the procedure statements; it consists of a *file* section, a *working-storage* section, and a *constants* section. A *file* description entry contains definitions of the manner in which the data is recorded on the file, the volume of data in the file, the size of the logical and physical records, the names of the file's records, and the keys on which the data records have been sequenced. The *working-storage* and the *constants* sections consist of record description defining units or sets of data; data names, values or ranges of values, number of characters, etc., are specified as needed. Editing a field can be accomplished in the *data division* by specifying such things as zero suppress, check protection, and float dollar sign, in a record description.

The *procedure division*, the heart of a COBOL program, contains the operations required to solve a given problem. Three kinds of expressions can be made in it: *imperatives* consisting of a verb and its operands, as MOVE A TO B; *formulas* made up of nouns (*quantities*) and the arithmetic operations of equality, addition, subtraction, multiplication, division, and exponentiation; and *conditionals* containing the key word IF followed by the conditions to be examined, and then followed by the operations to be performed if the condition is met. Conditional procedures are usually the essence of a data processing problem. The computations performed on the data are often almost trivial, but the series of tests required before these computations may be quite complex.

The three kinds of expressions can be combined (*with certain restrictions*) into statements, and statements combined into sentences. A group of sentences forms a paragraph, and paragraphs can be grouped into sections. Only the sections and paragraphs can be given names, hence they



are the only points of the program to which control can be transferred. Sections *must* be named, but paragraphs need names only if they are to be altered or entered out of sequence by the program. There are no set rules on what constitutes a sentence, paragraph, or section; these are merely arrangements to give the COBOL program readability and referencing.

The defined verbs, in general, generate the coding of the object program. (*IF is not a verb, but it also has this characteristic*). Verb categories are arithmetic, input-output (as *READ, WRITE*), procedural (as *GO, ALTER*), data-moving (as *MOVE*), and compiler-directing. The compile-directing verbs allow the programs to define other verbs (*whether they are English verbs or not, of course, makes no difference*) for subroutines, and to include any library subroutines he may wish to have. They also make it possible to use more than the COBOL language in a problem. Any other coding language for the particular machine can be entered *through* the COBOL compiler, if that language name is defined in the COBOL compiler package.

What we can expect

The short range committee, in setting down the original specifications for COBOL, was given the complete use of Sperry Rand's FLOWMATIC, IBM's COMMERCIAL TRANSLATOR, and AIMCO, the joint project of the Air Materiel Command and Sperry Rand. These three compilers had shown the level of development *at that time*, and a composite of them should have certain advantages over any one of them. Of course, the possibility exists that making a *common* language requires restrictions not necessary in a single-use language; if there are deficiencies in COBOL because of this, they appear to be minor. The committee recognized that the COBOL they set down would probably not be the ultimate in compilers, but they hoped it would be a good first approximation.

The manufacturers of computers were instrumental in setting down the COBOL specifications and their cooperation in the CODASYL project is commendable. Nevertheless, they have not, as a group, bounded to the COBOL cause at the expense of their partially-completed compilers. RCA, Sperry Rand, and Philco seem to be the leading proponents of the common language; RCA was scheduled to have COBOL available to its 501 users this month.

The Univac III, Sperry Rand's new solid state computer, is being readied for COBOL, to be avail-

able when the machine is scheduled. Philco is on its way to making a COBOL compiler for the S-2000, which is expected by 1962.

The other manufacturers are not reporting such progress in COBOL. The Honeywell business compiler, FACT, announced after the COBOL project was begun, is the only *present* aim at a compiler for the H-800. Their claim is that FACT is better than COBOL. General Electric has given the game a little twist; their General Compiler is going to be able to handle COBOL, they say. While this makes it possible to compile COBOL programs on a GE computer, the other advantages of the common language are lost in this type of set-up. IBM continues its work on COMTRAN, adopting a wait-and-see attitude toward COBOL.

It is certainly justifiable that some manufacturers do not drop everything for COBOL. The vast sums of money already expended on their projects cannot easily be overlooked. They are often committed to providing their customers with workable compilers as soon as possible. To a potential computer user, *any* compiler is advantageous, hence sales are little affected by their not having COBOL. And COBOL has not been shown to be the panacea—it has not even been *completely* defined—so why should the manufacturers go overboard?

Then too, work done on other compilers is not wasted in the COBOL framework. The system-enhancing features of a compiler should be able to be incorporated into the COBOL compiler for that machine. And the basic data processing subroutines such as sorting and merging, editing, tape handling, and check-out procedures are of great value to any system. They are *not necessarily* part of any COBOL package. Much of the work going into other compilers can be used either in COBOL or to make COBOL better for a particular machine.

The weight of evidence, however, is on the side of COBOL. Perhaps the current common language is not the answer to our problems of communication with a computer, only time will tell that, but all future compilers will have the common language features. Just as no one now would attempt to sell a 79-column punched card system, in the future no one will attempt to produce a computer language not common to others in existence. And the way that the competition in the computer industry is focusing on COBOL, the chances are very good that it will be the computer language of the future.



¹ The short range committee, realizing that implementations of all of the COBOL specifications would be a vast project, set down certain parts which would have to be included in a basic COBOL package. The 501 COBOL now available is the basic COBOL, capable of compiling most problems for the 501, but not necessarily able to handle everything. Other COBOL packages to become available in the future may also be of the basic kind, and 301 COBOL and 601 COBOL should be ready next year.



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NEWS SUMMARY

GENERAL

Financial reports

American Business Systems, Inc. posted record high sales for the six months ending June 30. Net sales amounted to \$1,784,960; earnings before taxes totalled \$154,281. Net income came to \$76,781 or 19 cents a share.

Anken Chemical Film Corporation reported sales and earnings for the first six months substantially above those for that period of 1959. Net income, after taxes, is \$375,789. This does not include the photocopy business recently acquired from Sperry-Rand.

Friden, Inc., also reported increases for the first six months of 35% over last year's figures. Net profit was \$2,837,439; \$2.46 a share. Friden authorized a 3-1 stock split in August, to be approved by stockholders meeting in mid-November.

NEW APPLICATIONS

Election predictions

C-E-I-R, Inc. has announced the results of its year-long effort with the Radio Corporation of America to prepare the RCA 501 computer to process the 1960 *Presidential election returns* for the National Broadcasting Company faster than in previous elections, and to make continuous projections of the outcome as soon as the voting booths close in the first state. Projections will cover the Presidential race, for electoral vote split, the total popular vote, and the popular vote split. Teams composed of political scientists, sociologists, economists and other skilled professionals gathered data for the mathematicians and programmers.

ATCOM, an Air Traffic Compiler designed for compatibility with the Air Traffic Control Data Processor, has been developed by Applied Data Research of Princeton. ATCOM does its *compiling operations* in two passes of an IBM 709, provides magnetic tape copies of the completed program to be read by an RW300, which in turn prepares punched paper tapes in the required format. ATCOM is now in operation at the National Aviation Facilities Experimental Center near Atlantic City.

MILITARY

Tape transmitted

The U. S. Army Corps of Engineers is installing five Kinetape magnetic tape *transmission systems* and 14 TE 206 Data Modems, supplied by the Collins Radio Co. The systems transmit over voice channels or telegraph lines for duplication of Univac tape. The additional Data Modems will transmit data to high-speed printers and other readout devices where duplication of the transmitted tape is not necessary.

FOREIGN

Processing 12,000,000 punched cards

A saving of two years or more in the time taken to process census of agriculture data collected in the Egyptian Region of the United Arab Republic will result from an arrangement recently made between the UAR, the Central Statistical Institute of Italy and the Food and Agriculture Organization (FAO).

Data will be fed into electronic computers in Rome in a pioneering venture in which the two countries will be working closely together and pooling their efforts to make this project work. The FAO is assisting because it sees the potentialities of electronic computers in the field of data processing and is seeking better methods of processing data to provide more timely information on the structure of agriculture and available food supplies, necessary to national planning.

During the entire operation, which will last until 1964, about 12 million punched cards containing data will be brought to Rome, processed, and flown back for home use. This involves several technical and logistic problems, such as questionnaire and code design, layout of cards, punching and editing procedures, replacement and correction of defective cards, the physical transport, storage, processing, computation and preparation of results. Special precautions are taken to insure security of census data.

The operation will not only save two years of time for the UAR but will also serve to train their technicians in the use of computers. Other countries are welcome to send personnel to the project for training in electronic computer use.

By Edith H. Goodman and John H. DeJong

OTAC (ARMY ORDNANCE TANK-AUTOMOTIVE COMMAND) at Detroit has all the problems of the automobile manufacturers in keeping track of parts, plus a few of its own. OTAC is responsible for inventory and procurement of parts for 10 continental United States (CONUS) depots, and the two major overseas depots for the Far East (AFFE) and Europe (USAREUR). These main depots are stations from which parts are drawn for all wheeled and tracked vehicles used by the active Army, Air Force, Navy, Marine Corps, NATO, and other non-communist countries under the mutual security program. Two hundred thou-

functioning smoothly on its two shifts of work. The third shift is given over to diagnostic routines.

There are 10 analysts, 12 senior and 10 junior programmers, and about 49 operators, schedulers, etc. The personnel familiar with the OTAC supply system were trained in procedures to run the system.

Input devices

Input devices consist of eight station typewriters which simultaneously produce typed copy and seven-channel paper tape; these are verified by typewriter-verifiers. From the paper tape 80 column cards are produced, which in turn are used to put data on magnetic tape.

BIZMAC at OTAC

Army Ordnance keeps inventory control on one of world's largest computers

sand varieties of parts are needed to keep the million vehicles in good maintenance.

To handle this king-sized job of data processing, OTAC has put it on its RCA Bizmac system. The installation was completed in October, 1956, and the projected program is now in operation on the system. Bizmac keeps an inventory on spare parts which includes what is on hand at every depot, how much is needed, what has been ordered in what quantity, and what is in transit; it has made possible a sharp reduction of inventory necessary to be on hand and has cut obsolescence.

A second arm of Bizmac's operations is cataloging of parts and prices, eliminating the need to typeset catalogs. This enables new manuals to go to all points within days, instead of months, of change. It has reduced visible files by about 75 per cent, from 18 files of ten million file cards, punched cards, metal plates, and handwritten sheets, to six visible files.

The third part of the program is forecasting supply requirements by 12, 24, and 36 months, and projecting budget costs.

Bizmac's physical proportions are huge: 220 units weighing 217 tons and requiring 250 tons of air conditioning for the 20,000 square feet of space allotted for it. Bought at a cost of \$4.4 million, OTAC's maintenance contract with RCA calls for seven engineers and 27 technicians to keep it

There are 182 tape stations, connected through a switching unit at central control, in rows of locker-like racks. Tape is magnetic, in 2400 foot reels, and tape units read/write forward or reverse at 1700 words a second (seven bits plus sign, dual written to prevent errors). All tape stations may be dialed like telephones from the consoles. A maximum of 96 tape stations may be used simultaneously.

Data processing units include three electronic sorters (off line) which have built-in programs for re-arranging sequences on tape, collating, searching and extracting information; they merge and extract simultaneously. With 200,000 different stock numbers to work among, the sorters are used constantly to find the 15,000-20,000 actives of any one day.

The computer accepts data from up to four tape stations at the rate of 10,000 characters per second. Arithmetic is 50,000 decimal digits add/subtract a second. Octal coding is used. The drum memory, which is used primarily for program, can hold 30,000 characters; core memory holds 4800 and is used as a *scratch pad*.

Output devices

Output units are two electro-mechanical, 600 lines a minute (120 characters), high speed printers. Two magnetic tape transcribers are used to

convert to either five channel standard teletype code or seven channel paper tape. Three document printers (modified Flexowriters) operate from seven channel tape and print in both upper and lower case. The document printers prepare entire manuscripts for catalogs, cutting both time and costs of typesetting.

Other output units are an IBM 046 to create punched cards from five channel paper tape, and a magnetic tape duplicator. (For security in processing data at key points duplicate tape is produced.) It is also contemplated that duplicate tapes be stored elsewhere in event of disaster.

Information comes in from the CONUS depots by 10 telephone-connected IBM Transceivers which punch information on cards at the rate of seven a minute.

Verification

Everything in the system is set up for verification to catch and prevent errors. This is true in the central control which has six consoles, used in teams. Operator-verifier teams are monitored from the monitor console which reflects what the O-V teams are doing. If everything is in order a key indicates to system console that it is ready to go. Buttons from consoles set computer and sorters to start and operate without attendance. The system console does not operate input-output devices since these require attendants at the units.

There is an interrogation unit for rush information; it connects to tape station equipment to search, extract, and print out information without interrupting the work of any other units. The entire file can be searched in three minutes from typewritten key codes put in at interrogation.

Before the new system was installed OTAC used conventional punched card equipment. This required up to three months for data processing now done within 48 hours.

Availability balance file

Information on OTAC's 123,000 inventory items is maintained on a magnetic tape availability balance file. Cost and quantity levels are kept both in summarized form and separated as to location within the thirteen depots. Changes to the file are posted every third day; notification of any item reaching the reorder point is made to management, and whenever a depot's level of an item reaches half of the normal amount a notation is made.

Foreign aid requisitions are edited weekly to determine authorization for issue, availability, most economical source of supply, date of availability, and price. The availability balance file is used in this editing, and is changed whenever a requisition can be filled. The Bizmac prepares shipping orders, status lists, control cards, and back order cards as needed in the filling of the requisition.

The availability balance file is edited daily as to source, date of availability, authorization, and price of each item demanded by the Army. Demands of all types are processed including extracts from initial source depots, stock leveling requests brought out in the posting run, and shortage reports. In most cases actions on these demands are taken by the computer, but in certain exceptional circumstances, management is given the information and left with the decision. On those items where action is taken by this editing routine, all necessary documentation is prepared as required; shipping orders, back-order cards, advice lists, status lists, and statistical reports. The outputs are sent to their appropriate recipients by transceiver or mail.

A financial analysis is made of the availability balance file each quarter. Besides its accounting function, this computer run serves to point out areas requiring remedial action through the computation of probable needs based on existing levels and historical records of use. The financial analysis points out instances of over- and under-investment for each of the depots and for all of OTAC. After this analysis has been performed, the file is reviewed by the computer to examine and, where necessary, recommend reorder point changes, deletion of items, and stock leveling procedures. Management action on these recommendations is instituted in the posting run.

The final quarterly use of the availability balance file is in the preparation of forecasts for the next 12, 24, and 36 months. Statistical application of the

Col. David W. Hiester, Program Coordinator for the Army Ordnance Tank and Automotive Command, checks incoming requisitions with Operator Janet Schonschack.



SUPPLY MANAGEMENT AVAILABILITY LIST																											
FILE NO	NRCC	STOCK NUMBER	ITEM NAME	U S S	P I A CODE	UNIT PACK	CHG C	CHANGE NOTE	MAC CODE	REF STOCK NUMBER	REP DATE	U S S	ITEM CLASS #	STANDARD PRICE	REORDER POINT QTY	SUPPLY MGT AVAILABILITY	REASON FOR OUT PUT	REMARKS									
2	5	5808327852	HOSE	AS	42	3	172	MAC	EM	674267828278520175	1	1	1	1000015400	590	1199	0193	926212									
0193		AVAILABILITY DATE		MISC OWN ACCT SUM		ACCT 30 SUM		ACCT 66 MISC CC		SUPPLY MGT DUE IN		DUE IN QUANTITY		SITE ON HAND CC 1 (D)		SITE ON HAND CC 3		DUE OUT QUANTITY		DEPOS INOUT LEVEL		QUANTITY SHORT-LONG					
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All told, the availability balance file is used in the preparation of 92 kinds of documents in seven areas: **1)** thirteen summaries for management analysis; **2)** thirteen by item reports for management action; **3)** fifteen documents going to the depots; **4)** twenty lists on status and control of requisitions; **5)** seven kinds of punched cards for the due-in, due-out file; **6)** eighteen documents to advise customers of action on their demands; and **7)** six types of reports to maintain the basic availability balance file.

The due-in, due-out file is a reflection of material due in from procurement, due out to customers, and in transfer between depots. It contains over 60,000 punched cards. A card prepared by Bizmac is manually inserted in the file for each of the above situations. Whenever a due-item is received at its destination, a contra-card is filed with the due-card. Periodically the file is summarized on accounting machines and new balance cards are cut representing the undelivered or unshipped balance on the item.

A file is kept of each type of vehicle and the secondary items of supply authorized for maintenance support of the vehicle. It is used with counts on the various types of vehicles to determine supply levels and reorder points. The file indicates also for how long a part will be needed on hand, and which parts can be deleted. There are about 235,000 items in this file.

The vehicle parts file contains about 300,000 messages of repair parts, equipment items, and special notes in the order in which they appear in the technical manuals. The file is updated weekly in a computer run, and part or all of it can be pointed out as required to provide cataloging of parts and printing of repair parts sections of technical manuals.

17

Capital Stock Record Keeping

Increased Sales Volume, Forces Use of Machines to Keep Up.

ROUTINE, REPETITIVE, NON-INCOME PRODUCING, are descriptive of the corporate functions of capital stock record keeping. Yet, in no area of its activities must the corporation be more careful and attentive than this one. Legal requirements dictated by its charter of incorporation, and the desire to maintain the goodwill of its stockholders, make this obligatory.

Many corporations, aware of the problems, divest themselves of the function completely by assigning it to transfer agents, usually banks, who for a price will do the work.

Our corporation, Nuclear Development Corporation of America, is a nuclear engineering firm whose capital stock is traded in moderate quantities "over the counter." Approximately 230,000 shares are outstanding in the hands of about 400 stockholders located in some 25 states. We have performed our own transfer activities since our incorporation in 1948.

Until about a year ago, we had few problems in this area. The system we used was completely manual, and due to a light volume of trading was rather simple to maintain. Then, trading activity in our stock began to increase and almost overnight our manual system became burdensome. We began to fall behind and the danger of errors increased. The old system that worked well with small volume could not accommodate a sudden spurt of activity and something had to be done quickly to rectify this situation.

A detailed systems analysis of our stock record keeping showed that all the desirable requisites for transfer to a data processing system were present, and we immediately took steps to switch over to our present setup.

At this point, let us briefly examine the records that the corporation must keep and the mechanics involved in a stock transaction.

Records

- I **Stockholders ledger**—contains detailed data relating to each stockholder including name, address, certificate numbers, date of purchase, number of shares, and method of acquisition of stock.

- II **Certificate ledger**—contains the same data as the stockholders ledger except that it is in numerical sequence by certificate number.
- III **Transfer journal**—contains a day by day itemization of each transaction revealing the contra activities of purchase and sale.

Types of Transactions

- I Original issuance of stock may be effected through sale by the corporation at inception or at other public offerings, through exercise of employee stock option privileges, or through conversion of convertible bonds to stock.
- II Reissues of certificates (*the common transactions*) take place when a stockholder buys shares of the corporation. The shares that he purchases are of necessity bought from another stockholder or broker and the "package," consisting of the shares sold and instructions to transfer ownership to the new holder, are sent to the corporation by the stockbroker who handles the transaction.
- III Conversion of certificates of stock into certificates of smaller denomination by existing stockholders.
- IV Sale of a portion of an existing certificate and reissue of the balance of a stockholder's holdings.

Procedure

The "package," mentioned above, is received in our corporate secretary's office and its contents are examined for completion of assignment, regularity of endorsement, necessary legal documents when applicable, required transfer stamps, and guarantees of signatures. Stock transfer instructions are complied with, the old certificates are cancelled and new certificates are prepared and signed.

The secretary's office prepares the primary document of our system, a stock transaction voucher, for each sale and for each reissue of stock to a new holder. This voucher contains all the information required by our stock ledgers.

(continued on page 31)



This is the new Diebold Modular Control Panel system. Shown here is but one of an almost unlimited variety of interior arrangements possible. In addition, you have a choice of three different cabinet sizes, drawer units, casters or stationary bases. And all these arrangements can be changed when an as your requirements change. The coupon will bring details without obligation.

DIEBOLD

INCORPORATED

Circle No. 18 on Reader Service Card.

DIEBOLD, Incorporated
CANTON 2, OHIO

Dept. OE-187

Gentlemen: Please send complete information on Diebold Control Panel Storage.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

DIO-1287

By William J. Askins

MAIL ADDRESSING

Utilizing punched cards for low volume addressing

ADDRESSING MAIL BY MEANS OF PUNCHED CARDS is often thought of in terms of mailing lists numbering into the hundreds of thousands. For this type of mailing list there have been many special addressing machines and methods developed. Because of their size and scope, elaborate and expensive machines are warranted for this sort of operation.

There are many of us with files of addresses for employees, customers and prospects numbering into thousands who cannot justify high volume machines to process mailing pieces. For this reason there has been some hesitation to approach addressing jobs that could be handled on our accounting machines, in spite of the low cost origination and replacement of files, the reduction in storage space, and the relatively unlimited machine processing capabilities inherent in punched cards. Addressing mail with accounting machines also furnishes a means of utilizing unscheduled machine time.

At Edgcomb Steel Company we have maintained our advertising list, which now numbers 20,000, on punched cards for the past eight years. These cards contain product interest indication, industry classification, number of employees and salesmen, and are used for general monthly mailings as well as frequent selected listings.

The following is a catalog of ideas growing out of this use and the varied problems we have faced. It is offered with the thought that it may be of some help to others faced with intermittent and unplanned short notice jobs or for small volume repetitive work. It is not intended for large scale users and the lack of detailed discussion of mass mailing equipment is acknowledged at this point. Wherever possible I have mentioned the names of manufacturers whose products we have used or who have given me information for my files.

To produce an addressed envelope using punched cards, there are four methods which can be used—enclosures, attachments, direct addressing and transfer addressing.

Enclosure for window envelope

As an enclosure address we can use any con-

tinuous form designed to be machine printed and folded so that the address shows in a window envelope. For short notice runs a stock marginally punched form such as Moore's #8530 can have the address positioned for any window envelope. To secure against shifting, forms of this type can be folded at one end and hooked over the enclosure so that they can be used with any size envelope.

Continuous punched cards or continuous 3 x 5 or 4 x 6 cards can also be used for this purpose, but must be inserted in a like-size envelope or fastened to prevent movement.

In the use of continuous cards, do not overlook the possibility of addressing blank cards in continuous form, bursting, and then having a printer surround the address with printing to give a custom form. We have used this idea on sales tax exemption forms which, when signed and returned, are filed for tax audit purposes.

On jobs involving limited numbers of addresses, the single sheet form feeding diagram shown in the 402-3 manual can be used. This, while it seems cumbersome, is fairly fast and certainly more accurate than manual addressing.

One objection to continuous cards (3 x 5, 4 x 6 or hand filed punched cards) is the serrated fuzzy edge left at the top edge of the cards when they are burst. This edge makes it difficult to separate the cards in the file and interferes with V-ing because of the extra bulk along the top edge. A simple solution to this problem is to run the cards through a standard office letter slitting machine which removes a narrow strip from the top leaving a clean rotary cut edge.

Also as an enclosure address I have seen labels, either pressure sensitive or glued, mounted on a form letter to be signed and returned.

For those installations with IBM 407 accounting machines and the volume to warrant it, there is available an address writing device. This feeds a tape diagonally across the type wheels so that three lines from three separate cards are printed simultaneously. The tape is designed for use in a Cheshire mailing machine.

Attachments

The universal device in this category is the gummed label carried as a stock item by Moore, Uarco, Standard Register and many other forms companies. It is available from stock at low cost in large or small quantities and its flexibility does not restrict advertising thoughts to certain shapes, sizes or methods in that it can be used on a 9 x 12 catalog envelope, a self mailer or a package of matches. These labels can also be secured as a two-part carbon interleaved form or, for the IBM 407 machine, as a two or three abreast label to reduce machine time for repetitive lists.

Davac glue on standard white labels is available from many companies. This permits the use of a whiter unglazed paper stock and eliminates the annoying curl ordinary glue causes when it is stored.

A development in this area has been the marginally punched pressure sensitive label. It is a heavy, pure white and smooth edged label which is several times more expensive than a water gummed label. Avery Adhesive Label Corporation has this in rolls with a rewinding device for the accounting machine as well as manual and electric dispensers. Another label of the same type is available from Allan Hollander Company and Standard Register in either rolls or fanfold form.

When using continuous labels which come in white and a few colors, do not let this lack of color prevent the use of color codes. When we ran our file folder labels, we encountered this problem. By using an ink pen held at the formstractor and re-running the labels on a continuous eject, we placed a neat vertical colored stripe on each side of the labels.

The problem in using labels does not lie in machine production but rather in the method of attaching them to the face of a mailing piece. There is no ideal machine on the market today in the low price range. The closest approach to any inexpensive mechanical means is found in the Wing Mailer (manufactured by Chauncey Wings Sons, Greenfield, Mass.) and the Dick Mailing Machine (manufactured by Dick Mailer, 137 W. Tupper

Street, Buffalo 1, N. Y.). Both of these machines are standard labeling devices used by newspapers for many years for attaching ungummed labels using a thin paste.

We chose the Wing Mailer because it seemed more heavily constructed. It has an attachment which fixes it to a base, thus taking away some of the weight, insuring a more uniform positioning and furnishing mounting for a pack holder for continuous forms. Details of the changes necessary to use gummed continuous labels in this machine have been forwarded to Chauncey Wings Sons.

Speed of application varies, according to the operator's co-ordination and skill, from 600 to 2000 labels an hour. The machine requires some mechanical aptitude to properly adjust, and glue tends to accumulate on the shear knives so that they must be wiped clean every ten minutes. If you must apply your own labels, we think this is the best and cheapest machine available, even though it is neither automatic nor trouble free in its use.

Oddly enough, in the light of our above experimental efforts, our volume has grown to such a point, and deadlines have been moved so close, that we now have all of our label application done by a mailing service in Philadelphia. Their charge for applying the label, stuffing and running through the meter machine is about \$10.00 a thousand. If this type of service is available to you, you can eliminate all label application problems by transferring them to the mailing service.

Direct address

In this phase, there have been considerable improvements and developments in the past few years. This type of addressing is undoubtedly the most impressive in appearance as well as the most costly.

The IBM Bill Feed is one of the earlier means of printing directly on the face of an envelope. It does, however, put considerable restriction on the envelope construction and size, is cumbersome and interfering with normal operation, and is a temperamental gadget when running.

Moore Business Forms and American Lithofold Co. produce a continuous carrier type envelope in which a standard envelope is mounted by its face on the back of a carrier strip. This offers a rather *two ply effect* when carrier strips are removed and the envelopes separated. They do run through any standard bursting machine with no special setup, and machine operation is excellent.

There are several end opening continuous envelopes available assembled from two separate sheets of paper and formed by sealing about $\frac{3}{8}$ " to $\frac{1}{4}$ " around the three sides. Uarco manufactures this type with a heat sealed edge. Another is manufactured by National Systems and Forms and Standard Register with a glue sealed edge. It pre-



sents in a #10 size a rather *large economy size* appearance due to the added $\frac{3}{4}$ " to $\frac{1}{2}$ " in edge seals. I also sympathize with the mail clerk who attempts to open it with a standard electric letter slitter. Avoid the use of this construction in #9 or #10 envelopes as there is considerable difficulty in inserting a folded letter endwise. In the larger sizes such as 9 x 12 or 10 x 14, they are eminently suitable and accounting machine operation is satisfactory.

Uarco also has available a top envelope of the same general construction which has an excellent appearance and is trouble free in machine operation. The insertion problem, of course, disappears with the top flap.

Curtis 1000 has a continuous standard envelope which consists of envelopes with open flaps mounted on a carrier strip so that the flap of each envelope is under the face of that preceding it. They are mounted by extensions at the sides which are heat sealed to the carrier strip. This method of mounting permits suppressing the carriage interlock in printing for the fastest possible print speed. Machine operation is satisfactory, and bursting is simple, either manually through the side perforation or by one of several low cost devices. It is available in most standard sizes and constructions, as well as *monarch* sizes for formal announcements.

There is also another mounting method for standard envelopes in which a perforated extension is made on the open top flap by which it is mounted on a carrier strip. This envelope is manufactured by Perfelope, Inc. of Newark, Delaware, and distributed by Standard Register and others. Machine operation is satisfactory and cost in #9 and #10 sizes is slightly lower than other types. Available in most standard sizes and constructions, as well as *monarch* sizes for formal announcements.

In addition to these envelopes continuous post cards are available. These can be custom printed or obtained as a stock form. Once again, the stock form can be addressed and later printed for short notice mailing.

A recently announced machine manufactured by Moore Business Forms is the Speedisealer. An address and invoice are printed side by side on the accounting machine and then fed into this machine which folds and heat seals the paper to form a postcard. Its use generally is by large volume producers of billings of this type.

Lying generally within this category is a method of customer coding a return envelope for remittance identification. The return envelope is mounted by glue spots within a multiple part form and by means of a carbon spot the code is printed on the envelope. The sample I saw was a custom form by American Lithofold, but the idea could be used with most other continuous envelopes.

Transfer addressing

In this method of addressing, the accounting machine is used to create a master listing from cards. In a separate operation and machine the envelope is addressed. Generally speaking it is most adaptable for high volume operation and the equipment cost prohibits its consideration for low volume applications.

Scriptomatic manufactures a spirit addresser which prints directly from a reverse impression on the back of a punched card. This gives all the advantages of machine processing and selection without involving the accounting machine. The master addressing card can be created on a standard typewriter or with continuous cards in the accounting machine. The addressing unit is available in models ranging from a \$25.00 manual model upwards. The master has a life of 250 impressions before having to be renewed.

Addressograph Company has a heat process machine model A1 which prints from a reverse carbon impression listing by the accounting machine. This machine is fully automatic both for list advance and envelope feeding. Price is out of the low volume class but it might be considered in some installations.

Another form of this type of addressing is continuous stencils which, while not usable for mailing lists, can be employed for addressing multiple packages resulting from an order or highly repetitive mailings. The stencils are cut on the accounting machine and then mounted in a hand-printing device. These are available in fan-fold forms from Stencil Label Company or in rolls with a rewind device from Weber Label Company. Weber also makes a stencil with a pressure sensitive strip which can be fastened on selected continuous forms to produce a shipping label where needed.

These are the mechanical means through the use of which many users of punched card equipment can take better advantage of the potential of their installation. All of us have some sort of list which perhaps can be better handled using punched cards as the storage, processing and addressing medium. There are mailings for stockholders, employees, customers, price bulletins, advertising, and even merchandise delivery where this method can be used.

Card costs are a fraction of that of other means of addressing. Origination, replacement and correction of files is fast and economical. Above all, here are unlimited selection possibilities which few other systems offer. The speed of selection reduces the total processing time. Another advantage is that punched cards can easily be used or converted when a list grows to high volume machines. ■

Mark a date . . . to see the new UNIVAC OPTICAL SCANNING PUNCH

OCTOBER 1960						
SUN	MON	TUE	WED	THU	FRI	SAT
						1
2	3	✓	✗	✗	7	8
9	10	11	12	13	14	15
16	✗	18	19	20	21	22
23/30	24/31	25	26	27	28	29
1 47 3 49 5 51 7 53 9 55 11 57 13 59 15 61 17 63 19 65 21 67 23 69 25 71 27 73 29 75 31 77 33 79 35 81 37 83 39 85 41 87 43 89 45						

... another major first for 90 column punched-card users!

- **SINGLE-STEP AUTOMATION.** Eliminates key punching. Reads marks *optically*, transforms them into punched holes—all in one operation.
- **EASY, ACCURATE.** No special pencils are needed. Use any soft, ordinary pencil.
- **FASTEST.** Reads and punches up to 6000 digits per minute, or 9000 cards per hour.
- **BIG CAPACITY.** Senses and punches up to 40 columns of marking on one side, 80 columns using both sides.
- **BUILT-IN RELIABILITY.** Adjusts even to faint markings. Internal checks eliminate errors.
- **BROAD APPLICATIONS.** Piecework computation, inventory, billing, order department, labor distribution, many others.
- **BROAD USABILITY.** Anyone who can use an ordinary pencil.

For full details, call or write the Remington Rand Branch Office in your area. Ask for a free copy of the NEW BROCHURE "The Optical Scanning Punch."

Circle No. 8 on Reader Service Card.

REMINGTON RAND
UNIVAC
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RAYMOND DREYFACK

Management's Challenge: Effective Communications

HAVE YOU EVER TAKEN PAUSE from the daily tumult of problem solving, paperwork battling and brainstorming to reflect that you're participating full steam in mankind's most dramatic transition to date?

We are now well into the throes of the second and greatest industrial revolution. Plastic, paper, wire, steel, electricity, and heaven knows what next, are being ingeniously mustered by man to replace brain wear with hardware, monotony with electronic manipulations. It is happening at a mushrooming rate which, 25 years from now, will make our efforts of today seem medieval. Moreover, data processing specialists (*a polite term meaning overworked combination of accountant, technician, philosopher and psychiatrist*) are smack dab in the midst of it.

The challenge to the individual is a staggering one if confronted squarely. How well we meet it will vary in direct proportion to the effectiveness of our communications. Today, in the data processing department — particularly in the computerized operation—a lack of proper communication could mean failure and chaos.

How many different pieces of paper enter your in-files during the course of each day? How many actions, reactions and transactions are touched off as a result? How many people, desks, key-driven machines, automated machines, accessories, forms and facilities are involved? Overwhelming when you consider it, isn't it?

Think in terms of a month or year. Thousands of pieces of paper, hundreds of meanings and shades of meanings. How do you pattern this influx into a semblance of sense? How do you get the avalanche to flow instead of crash down on you?

Effective communications is the answer.

Let's say you've studied and de-

fined your problems, investigated your hardware, established an economical *modus operandi*. You know what should be done, when it should be done, and by whom.

Where do you go from here?

In the first place, what is your department's know-how rating? Are enough people trained in enough different areas to cover absence or resignation? Are they really trained, or do you just think they are?

Joe Dugan is a punched card operator. Presumably *trained*. But is Joe doing his job the same way you would be doing it if you were in his place? That procedure Joe is following: Is it the one originally planned, or some wild distortion of the correct version? How well has your original intention been communicated to Joe's mind and actions?

How accurate is the translation from original concept to operating instructions? Are you using to their full extent the language of data processing: written manuals, flow charts, specimen sheets? How effectively are you bridging the gap between the mind of the thinker and the mind of the doer?

Bridge the gap

Here's another bridge in need of crossing. Performance. Quality should be the prime goal of every data processing operation. Quality of processing, management, control, information, service. If quality is to be more than a dream, however, its elements must be effectively communicated between those who manage and those who are managed.

Temper fairness with firmness, and both with humanity. Let your people know what you expect and where they stand. More communications.

Sally Jones has a problem; Bill Smith has trouble at home. Maybe this is none of your business. On the

other hand, maybe they'd like to feel you're interested and concerned. That's where the input of communications comes into play. Is your ear available when needed? Do you pause long enough in your hectic scuttling to sit down and learn what makes your people tick? Why they're good or bad or indifferent? Bored or bitter, fast or slow? Do you communicate on a human basis?

Ten, twelve or twenty times a day, you should ask yourself this question: Is the message getting through?

You have a great idea for a new application, for example. In your mind it's spelled out clearly and concisely. It's practically foolproof. All you have to do now is sell the boss. More of you-know-what.

How adept are you at translating what is in your mind to the busy, over-taxed and frequently preoccupied brain of your superior? How well do you plan such communication in advance? How thoroughly? Do you time it properly? If you try to reach your superior at an inopportune time he may cut you short, reduce the effectiveness of your thought transference.

Problems

Communications problem number one then is people. Those you manage; those who manage you.

Now for problem number two. The big link between those pieces of paper and the end result of all that processing. Hardware, machines. Conventional, unconventional, and just plain ornery. The whole gamut from punches to computers. From input to output.

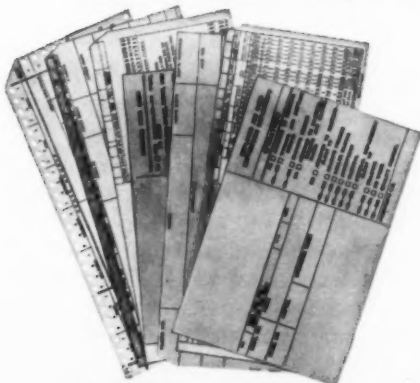
Here the communications requirement is between the mind of the engineer and the data processing processor. Another tough trail to blaze. Another Big Challenge. Courses, study, experimentation, trial

(continued on page 44)

Here is a completely new labor cost data computer



it's the new Calculagraph 500 Series



FITS ANY SYSTEM . . .

Now the completely new Calculagraph 500 Series labor cost data computer brings automation to the largest single cost factor of most businesses — labor time.

As a system in itself or as an integral component of any cost control system, the Calculagraph corrects the weakest link inherent in most systems by automatically computing and printing actual hours worked. This will assure 100% accuracy by eliminating the human frailties in manual computation and, in most cases, eliminate most of the clerical labor costs.

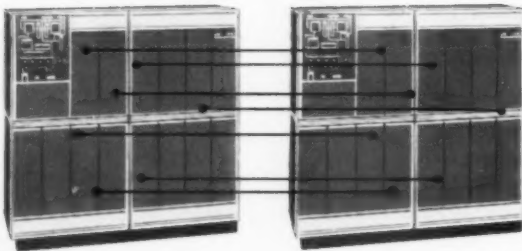
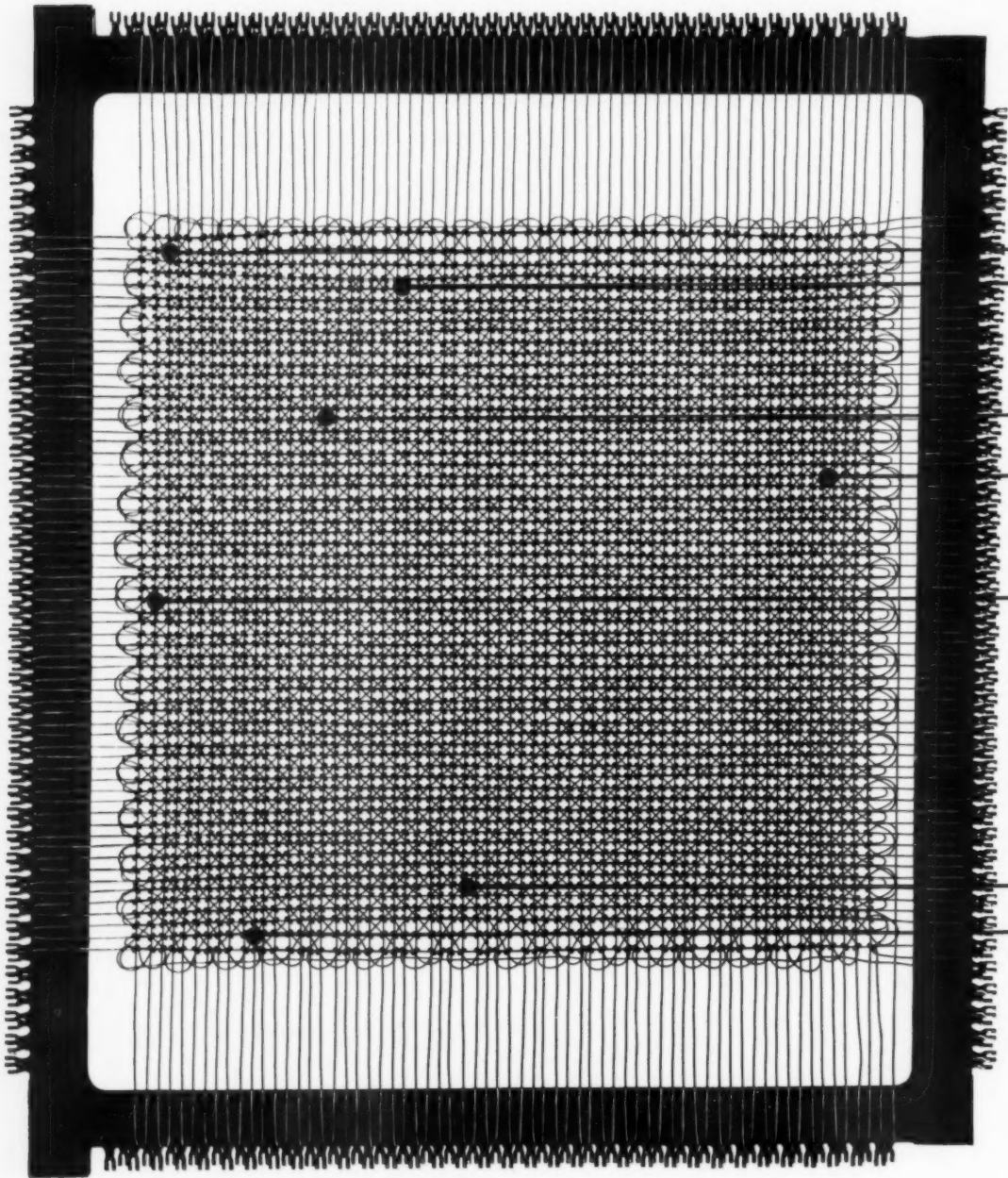
As a result, in a unit card system, the Calculagraph 500 Series can save time, clerical costs, and attain greater accuracy in your input data. It can be installed without disrupting your present factory-to-office data collection procedure. We can show you how if you will send samples of your present job cards for analysis.

INDUSTRIAL DIVISION

CALCULAGRAPH *Company*

275 RIDGEDALE AVE.,
HANOVER, NEW JERSEY

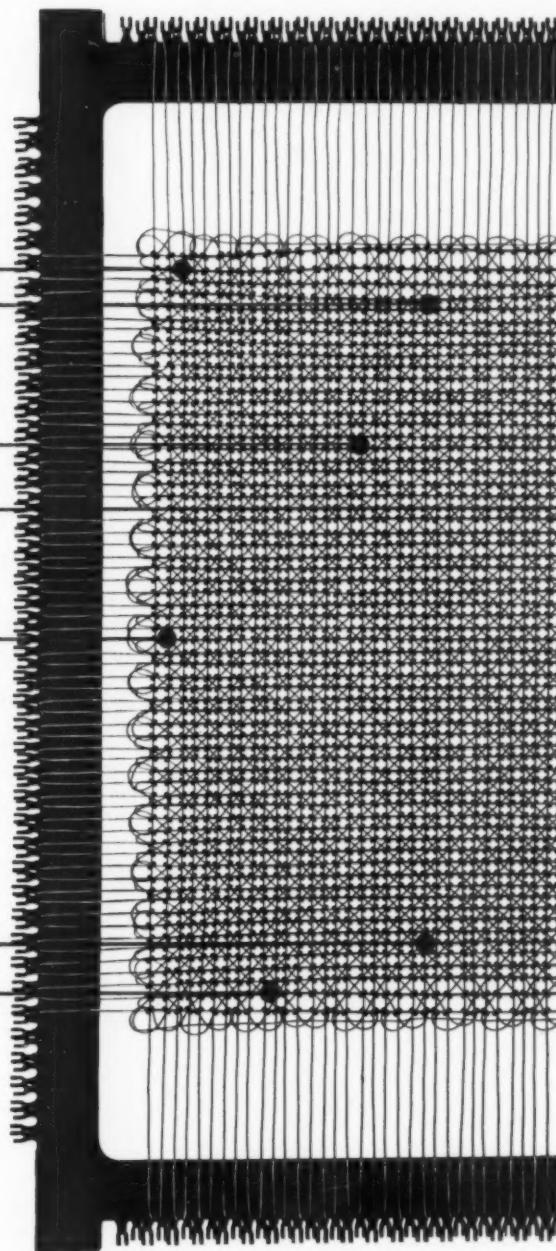
Circle No. 9 on Reader Service Card.



New kind of TELE-PROCESSING system: IBM 1401 systems send and receive information directly, with no intermediate handling of the message.

A new device enables the IBM 1401 data processing system to serve as a low-cost, two-way communications system in addition to its regular processing functions. With the new IBM 1009 data transmission unit, plus related dialing equipment, a 1401 can send data over long-distance or leased communication lines directly from its electronic memory to the memory of another 1401. There's no detour for transferring the data to cards or tape.

NOW
IBM 1401
DATA PROCESSING SYSTEMS
"TALK" TO EACH OTHER
LONG DISTANCE —
MEMORY
TO
MEMORY



This machine-to-machine transmission saves time and effort, improves accuracy. The versatile 1401's card and tape facilities can be used for input and output. The 1401's high-speed printer also may serve as output. The transmission unit can also team up with other sending and receiving equipment developed for IBM TELE-PROCESSING systems.

This expansion of the 1401's capabilities makes possible a fast flow of information into the home office from a wide network of field installations. Business and scientific organizations can make profitable use of this new advance for such applications as

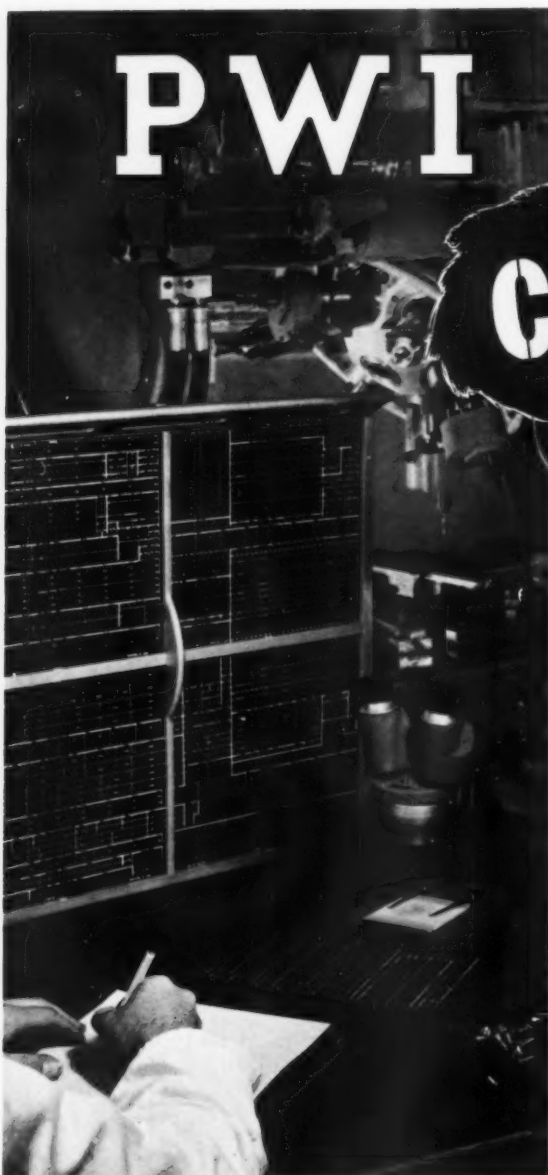
Circle No. 10 on Reader Service Card.

accounting, inventory control, engineering, production scheduling and sales communications.

Can an IBM TELE-PROCESSING system help you? Business information is useful only if it can be acted upon. TELE-PROCESSING systems make data available where and when it's needed. With years of data transmission experience, IBM can make your business data more useful. Ask your IBM representative about the advances in TELE-PROCESSING systems and what they can do for you. Data Processing Division, International Business Machines Corporation.

IBM[®] TELE-PROCESSING

Trademark



PWI

...maker of fine instruments...

certifies

every panel

issues you a certificate ... proof ... a
guarantee of highest quality, durability ...
of positive performance, even
after years of use!

Every certified panel is completely fabricated within PWI's modern, automated plant equipped with programmed automatic machine tools for the manufacture of precision products and instrumentation. Every panel is "on gauge" with a micro-tolerance master prototype ... must meet the exacting requirements of the many test stations located along the PWI control panel manufacturing and assembly lines.

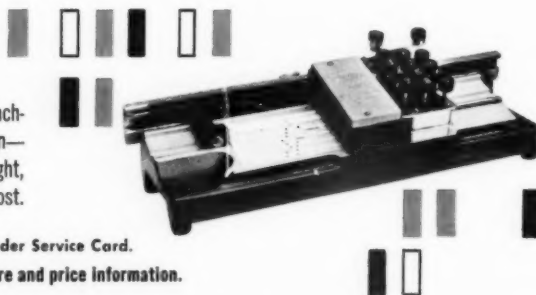
Every part ... all raw material ... wear-resistant aircraft type aluminum alloy ... every high-impact-strength molded insert ... conforms to rigid quality-control standards.

Only a manufacturer who has complete in-plant control of his entire manufacturing cycle can guarantee such enduring quality. PWI ... maker of fine instruments ... does this.

A complete line of self-contacting control panels and wires • Key punches • Gamma filters • Wiring tools • Accessories •

"001" KEY PUNCH

PWI "001" Auxiliary Key Punch ... simple, convenient means for punching numerical data into standard tab cards. Standard keyboard design—tab stop—quick release—simplified skip mechanism. Light in weight, easily carried. Highest quality—built for years of service. Nominal cost.



Circle No. 13 on Reader Service Card.

Write for descriptive literature and price information.

PWI

Panels Wires Incorporated.

755 PENNSYLVANIA AVENUE, SAN FRANCISCO 7, CALIFORNIA.



RAY MARIEN

-A Monthly Feature

Marien on FORMS

The Many Meanings of Forms Control

WHAT IS FORMS CONTROL? That question is a good one because forms control means many things to many people.

To the printing buyer, forms control means *goodbye* to hit-or-miss forms purchasing. No more will he become involved in endless squabbles with vendors over the *meaning* of some of his orders. No longer will there be any question about specifications, or room for the printer to run the price scale and hit him with charges for fancy *gimmicked-up* printing he didn't need.

He'll be furnished with complete, detailed form specifications, spelling it out to the printer down to the last weighted line and type size. The paper color, margins, ink, weight, size, everything, will be there that a printer needs to base his bid on. The printer will know that there is no room for misinterpretation of the specs. They'll be professionally prepared and will enable all vendors to bid on *exactly* the same form, not merely on *their* version of it.

To the office clerk it means the beginning of a happier existence under his mountain of paperwork. No longer will he have to squint his eyes at weak, hazy lines and misplaced captions. No more will he have to hunt all over the form for the correct area to fill in, or puzzle over the meaning of some captions. The forms will be scientifically designed. Instructions will be at the top—where they belong, not at the bottom, stuck there as an afterthought to bedevil the clerk. After he's filled it in laboriously, he reaches the bottom and finds out he should have *prepared it in triplicate!* How many clerks have been found hanging by their neckties to the stockroom rafters, because they had to do a form over for that very reason?

The office clerk will discover that forms can be a pleasure to fill in, and there is beauty in the paper form as well as the female one. The information will flow in logical se-

quence from one form to the other. He will not have eight inches of space to answer a *yes* or *no* question and a mere quarter of an inch to fill in an address (city, county, parish, province, country, etc.).

His previous conception of the ideal form, the office steno, will be a happier person also. Now, when she puts a requisition in her typewriter, she won't have to soft-roll the carriage for every single line because it was not designed for vertical typewriter spacing. Nor will she have to position it vertically 99 times per page on heavy fill-in work. It will be designed for a minimum number of tabular stops, and they will be *in line*. Snap-out forms will replace the tedious handstuffing of carbons she used to do to prepare multi-part forms. In fact, if she does a great number of them, she'll be equipped with continuous forms fed through a *forms-feeding* attachment on her typewriter, which will automatically position each one at the proper starting point and thence down to the next writing line and so on, with flicks of a lever.

To the busy executive who has a minimum of time for routine matters, it signifies the beginning of a new era. The reports he has to wade through daily in ever-increasing numbers will be simplified, streamlined and designed so that the pertinent figures he needs will pop out at him and the extraneous matter will be relegated to a minor position. The fat is cut away and he can concentrate on the meat. Equally important is this undeniable fact—if a clerk spends hours trying to figure out the meaning of poorly designed forms, how much more costly does it become when a high-priced executive wastes his time at *paperwork translation?* If money can be saved by freeing clerical time through better forms design, then a *gold mine* is uncovered when the boss spends only a minute on a form instead of a half hour!

The time saving factor carries through again when forms distribution is considered. Snap-outs and run-off copies reach their destination quicker when color-coded, or designed with ballot-box distribution.

Company image

To the company's customers or vendors, forms control means they'll be confronted with a different *corporate image*. The forms that reach them in the way of purchase orders, sales orders, invoices, statements, quotations and the like, will be examples of the forms designer's art and not sad, haphazard pieces of paper which are not true representatives of a fine business organization.

The clear, meaningful, order acknowledgement containing all the factual information the customer needs to know about his order does far more to signify the business-like qualities of a company than some hatched-up, weakly designed, poorly worded form which omits vital information.

To the company's systems man, it means he has found a working partner who will team up with him in streamlining the company's paperwork. Forms are the basis of all systems and the systems man's job becomes easier when he knows, first of all, where to go to find them all grouped functionally, for systems study, and numbered for easy identification.

He can concentrate on developing the system, knowing that the forms designer will carry the full load regarding machine and paper specs as well as form layout. His knowledge of the equipment's mechanical limitations will be added to the forms man's knowledge of printing and paper, an unbeatable combination.

Yes, a forms control program *will* accomplish all that. And it will fill a vital need for all the others who come in contact with it, both within or outside of the company. It is truly many things to many people. ■

By Kenneth T. Dutton

Job Operation Summary

Job outlines simplified with columnar form.

IN ANY WELL RUN DATA PROCESSING INSTALLATION, it is important that each regularly performed job be outlined in detail. In addition, the first quality demanded of a job outline by the efficient operator is that it be concise. He wants an outline which he may review quickly previous to an involved month-end job, and also one to which he may refer during the course of the job and instantly find there a forgotten detail or the exact nature of a slight change which has been hurriedly mentioned by the supervisor.

In the columnar form being described, the operator finds each type of information always in the same place. Each step is described in as few words as possible, using in the first column only a verb, e.g. "sort", "list". A separate column is devoted to the object part of the sentence and also to each of

the fill-in details such as the cards being worked on, the card columns, the control panel, new cards introduced in the step, person or department receiving the report, place to leave cards. Any additional notes necessary are also kept separate and in the right hand column.

Machine set-up information is kept at a minimum on the job outline and is provided wherever possible on the control panels which, of course, are all numbered and are referred to by number. Each non-permanent control panel is diagrammed and similarly numbered.

This form provides all of the "how to" information and none of the "why" information. It is not meant to supplant the supervisor's book form writeup of an application but only to supplement it and to increase efficiency. ■

QUARTERLY DEALER PURCHASE REPORTS

Due Out: 20th of Month

Step	Operation	Card Cols.	Panel Diag.	Paper Tape	New Cards	Disposal of Rep.	Disposal of Cards	Misc. Notes
1. Merge	Three months cost detail into one deck.		2 H					Treat domestic and foreign cards separately. Change three wires per diag. for foreign.
2. Merge	3 months' deck with product class headers		2 H					As above.
3. Reproduce	Both foreign dealer and domestic dealer master decks	100%	8		Yellow 5081		Return masters to file (Merge foreign).	Gang punch qtr. col. 50 and year cols. 52-53. Use only foreign dealer cards having 0-0 in columns 47 and 48.
4. Interpret	Name cards, upper and lower		2 & 3					On panel 3: Change wire for foreign codings.
5. Match-Merge	Name cards ahead of detail and class header cards	44-41	9 L					Change three wires for foreign per diagram L.
6. Select by Hand	From the merged deck the sets of header cards for any dealers who had no sales for the quarter.						Place them in sorter rack.	
7. List	Dealer reports cutting summary		19 523-10 J	Form Qtr. dlr. sales	Blue 5081	Sales Dept.	Box, label and store	

Capital Stock . . . (continued from page 18)

The stock transaction vouchers are attached to the original package from the broker, plus the new certificate and sent to the chief accountant's office for checking and for assignment of a stockholder number to each new stockholder. The chief accountant sends the vouchers to data processing and returns the "package" to the secretary's office where the cancelled documents are filed. Data processing prepares a stock transaction journal from each batch of vouchers and sends a copy to the chief accountant and to the secretary. The secretary's copy is checked to the new certificates which are then mailed out to the stockholder.

Weekly, or more frequently when required for special purposes, the stockholders and certificate ledgers are prepared.

Mailings to stockholders are expedited by the use of gummed labels prepared by data processing using the stockholder's ledger cards. Up-to-date lists of stockholders, alphabetically, geographically, or in any other form, are, of course, always immediately available from our ledger cards.

Our system is simple and logical and proved workable immediately with remarkably few "bugs" to work out. We would be happy indeed, if installation of other applications of data processing could be accomplished as smoothly. ■

BEEMAK TAB CARD HOLDERS



BP-100 CARD HOLDER

Can be attached to products, conveyor belts, bins, boxes, shelving, to implement production control, inventory control, invoicing and other punched card systems. Beemak Holders have withstood hard usage for eight years and are made in ivory, red, green, blue, yellow and black for color coding if desirable. Keeping correct tab cards at the source of record data provides better controls and faster handling of all types of merchandise.



BP-130 MAGNET HOLDER

Card holder with four heavy permanent magnets can be attached or hung on any metal surface such as tab machine, filing cabinet or metal desks. Provides finger-tip accessibility to operators, reduces wasted time and chances of error.

1 to 24 \$1.50 each; 25 to 49 \$1.35 each; 50 or more \$1.25 each. Available for immediate delivery from

BEEMAK PLASTICS

7424 SANTA MONICA BLVD., LOS ANGELES 46, CALIF.

Circle No. 15 on Reader Service Card.



- speeds labeling...outperforms old-fashioned addressing 4 to 1
- increases efficiency of tabulators...
- saves time and money
- sticks without moistening...adheres quickly to any smooth clean surface

JUST 2 SIMPLE STEPS...

FIRST—as the tabulator imprints Avery Tabulabels they smoothly rewind themselves into easy-to-handle rolls.



SECOND—an Avery electric dispenser completes the cycle—and the imprinted Tabulabels are dispensed quickly, easily, neatly!

THIS IS AN AVERY TABULABEL

1 Drug chain codes thousands of warehouse items on bins and shelves with Tabulabels.

THIS IS AN AVERY TABULABEL

2 Mid-West farm equipment mfg. boosts imprinting from 120 to 400 labels per minute.

THIS IS AN AVERY TABULABEL

3 Giant West Coast bank addresses 7000 packages of travelers checks daily to world wide destinations.

THIS IS AN AVERY TABULABEL

A few market-tested uses for Tabulabels: Addressing envelopes—bin and shelf markers—identifying products and cartons—inventory control—part number identification—labeling file folders—and you may discover others!

AVERY
Tabulabels

try them today!

write for

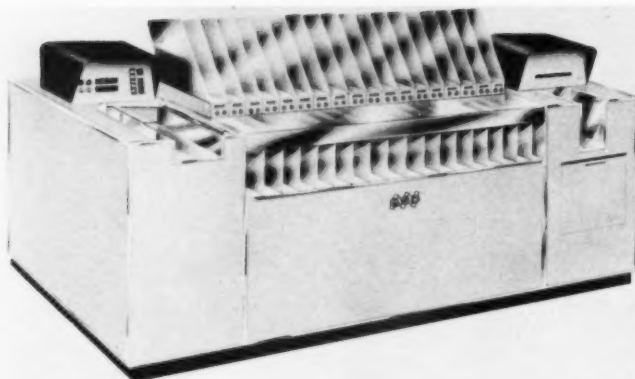
FREE samples now.

AVERY LABEL COMPANY Div. 183

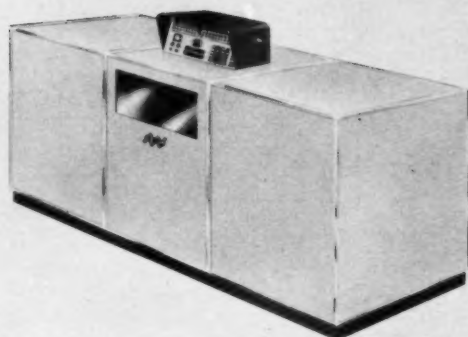
117 Liberty St., New York 6 • 608 So. Dearborn St., Chicago 5 • 1616 So. California St., Monrovia, California • Offices in Other Principal Cities

my name _____
company _____
address _____
city _____ zone _____ state _____

Circle No. 12 on Reader Service Card.



DOCUMENT PROCESSOR



DICTIONARY LOOK-UP UNIT

New Equipment

New MICR Equipment

National Data Processing Corporation, Dallas Texas, has developed and is manufacturing a line of equipment designed specifically to automate commercial banking functions. Included are the NDP Bank Document Processor for reading, sorting and processing documents encoded with magnetic ink characters; the Dictionary Look-Up *electronic brain* unit for controlling the operation of three document sorters simultaneously; Data conversion units; a complete line of Encoders for imprinting documents with magnetic ink using E-13B type font and the READATRON equipment for the optical scanning and automatic key punching of documents.

The company has been awarded two contracts by the Federal Reserve Bank of New York to develop equipment required to encode and automatically sort and process checks by means of magnetic ink character recognition. NDP equipment will be used in four of the five Federal Reserve pilot installations and one will use NDP equipment exclusively. Similar equipment to automate document handling is being sold to commercial banks.

Processor

The NDP Bank Document Processor is available in three different models. The basic sorter, Model 201, has 18 pockets of which 16 receive sorted documents and two receive

rejects. The sorting speed of this machine is 1,200 items per minute and at this same rate the sorter has the capability of automatically endorsing documents handled. Self checking features such as on-us bank number verification and customer account number check digit computation are included to insure the accuracy required.

The Model 201 Processor provides two operating modes. Mode A is a conventional digital sort to the first 10 pockets of the machine, with out-sorting of high activity items to the remaining six pockets. Mode B sorts selected high activity items to all 16 sort pockets and delivers remaining items to one of the reject pockets. This multiple pocket out-sorting is accomplished through the use of a memory device which stores the high activity numbers, along with their pocket destinations for comparison to the whole numbers read from the documents. Information encoded on checks passing through the sorter is placed in temporary storage within the sorter and is thereby available for readout to peripheral equipment as well as for sorting operations.

Document Processor, Model 202, includes all features of the Model 201 and in addition provides a 24 column lister with capacity for accumulating 3 totals. The lister prints at 1200 lines per minute and provides item listings of all documents passed through the processor and, upon command of control documents, lists

accumulated totals. Typical totals may be: batch total, cash letter total, and master total. Model 203 is the same as Model 202 but contains sixteen additional accumulators providing totals for each of the sixteen sorting pockets.

Dictionary look-up

The NDP Dictionary Look-Up control units may be used with any of the three document processor models. Dictionary look-up provides exceptional economy in the sorting of large volumes of documents. Sorting to 4096 end points for instance, can be accomplished in a maximum of three sorting passes; or 65,696 end points in a maximum of four sorting passes with another model. The Dictionary look-up control will direct the operation of up to three document processors simultaneously and provides two separate sort programs either of which may be used for any one of the connected processors. The entire program can be changed in less than seven minutes.

NDP also provides equipment for the conversion of data read from the documents passing through the sorter. Data conversion units are available to intercouple the document processor to most banking machines or to provide offline, computer compatible magnetic tapes.

Encoders

Five models of encoding machines are available to enter E13B mag-

netic characters on documents. The Proof Machine Encoder attaches to a standard IBM 802 or 803 Proof Machine and provides the amount encoding of documents as an automatic by-product of the normal proofing operation. The Adding Amount Encoder enters amount and control data information on documents, accumulates two proof totals and prints a proof list on adding machine tape. The Account Number Encoder and the Bank Number Encoder provide for the encoding of the remaining check fields as recommended by the American Bankers Association. Also available is the Full Field Encoder designed to encode all fields on a check, if required, while operating basically as an amount field encoder and proofing machine.

The NDP Readatron Credit Card System can be used in all credit card applications and provides complete automation of the various processing functions required from the point of sale to the preparation of periodic customer statements. The recorder imprints the account number from embossed credit cards and the dollar amount set on the recorder dials. The converter, coupled to a standard card punch, optically scans the imprinted characters and automatically punches this data into the original document.

NDP bank equipment is available for delivery to commercial banks a maximum of one year from the date of placement of the order. Magnetic encoding devices and document processing equipment delivery to the Federal Reserve Banks began July, 1960.

Proof machine amount encoder

- The lowest cost method of amount imprinting during proof machine operation
- Encodes automatically during normal

PROOF MACHINE ENCODER



- mal proof machine operation—no reduction in effective speed
- Installs in minutes on the standard 802 and 803 proof machines
- Eliminates operator retraining
- Automatically positions document for imprinting and inserts it in proper proof machine pocket
- Bypasses encoding when operator desires
- Optional: Imprints transaction automatically.

Adding amount encoder

- Encodes amount field and prepares zero balance proof tape simultaneously
- Accumulates deposit and batch totals in two registers
- Totals items in two counters for batch and production control
- Automatically positions documents for imprinting . . . automatically stacks documents after imprinting
- Optional: Imprints transaction code automatically.

Account number encoder

- Imprints customer account number—up to ten digits
- Counts items automatically for batch control
- Repeats keyboard entry for automatic multiple check encoding
- Shifts to encode punched card checks
- Automatically positions documents for imprinting . . . automatically stacks documents after imprinting
- Optional: Encodes your transit number simultaneously.

Transit number encoder

- Imprints ABA transit number-routing symbol
- Counts items automatically for batch control
- Repeats keyboard entry for automatic multiple check encoding
- Shifts to encode punched card checks
- Automatically positions documents for imprinting . . . automatically stacks documents after imprinting.

Circle No. 30 on reader service card.

IBM 1009 Data Transmission Unit

The IBM 1009 is a unit which enables the solid-state IBM 1401 com-

puter to be used as both a data transmitting and receiving terminal. This is in addition to its basic function as a data processing system.

A 1401 equipped with a 1009 transmits data over telephone or telegraph lines at speeds up to 150 characters a second to a similarly equipped 1401. Input of data to be transmitted can be fed into the computer from punched cards or magnetic tape. Alphabetic or numerical business or scientific data is transmitted from 1401 core storage directly to 1401 core storage at the receiving location, where data can be processed and then produced in the form of punched cards, magnetic tape, or printed documents.

An IBM 7701 magnetic tape transmission terminal may also be used as a transmitting and receiving terminal for direct two-way communication with a 1009-equipped 1401. Operating at the same transmission rate of 150 characters a second, the 7701 handles all magnetic tapes used on IBM data processing systems.

A 1009-equipped 1401 can thus talk either with a second such 1401 or with other IBM data processing systems through a 7701 or another 1401. The 1009 and 7701 both will transmit over toll or leased telephone lines or high-speed telegraph lines any distance across the country.

How it works

Both transmitting and receiving are under stored program control of the 1401. When the transmit and receive programs have been loaded into the 1401 systems at two locations, the computers can be used for two-way, core-to-core transmission.

When using telephone company equipment, the sending station operator places punched cards or a magnetic tape reel in the 1401, switches the 1009 on, and then dials the telephone number of the receiving station. Learning that data is to be sent, the receiving location operator verifies that the receiving 1401 is prepared to record the transmission.

Data flows, a character at a time, at speeds up to 150 characters a second, from the core storage of the transmitting 1401, through its 1009 unit, into a modulating subset provided by the telephone or telegraph company and over the communications circuits, to a demodulating subset at the other end. From there, it passes through the 1009 to the core



An IBM 1401 computer equipped with the new 1009 data transmission unit shown above can talk directly from its core memory to the core storage of any similar computer via telephone or telegraph lines. Here, an operator at a 1009 connected to a nearby 1401 has received a telephone call from a distant office with a similar installation. Learning that data is to be sent, he tells the sending station operator that his computer is ready to receive. After communication, which takes place at rates up to 150 characters per second, the data is processed and recorded by the receiving 1401 in the form of punched cards, magnetic tape or printed records.

storage of the receiving 1401 for processing.

While data is being transmitted or received, either 1401 can perform simultaneous tape-to-printer operations. When the information has been received, both operators simply replace their respective telephones on their cradles, thereby releasing the 1401s for regular data processing operations.

Transmitting and receiving procedures with a 7701 magnetic tape transmission terminal are similar.

Equipment details

The 1009 is housed in a single standard modular system (SMS) swinging-gate module designed for ready access and serviceability. Because of its low heat dissipation, which is equivalent to that of two persons, additional air conditioning beyond that required by the solid-state 1401 system is normally not required. The unit is cable-connected to the nearby 1401.

The 1009 converts each character from binary-coded-decimal or binary form into a special code for transmission. Grouping of records at the receiving 1401 is identical to the grouping on the original records transmitted.

Like the 7701, the 1009 features automatic detection and correction of reading and writing errors, and of errors in transmission. After

each record is transmitted, a signal is sent back from the receiving 1009 or 7701 to indicate that each character in the record was received correctly. The receiving 1009 or 7701 is then ready to accept the next record. If an error is detected, the record is retransmitted automatically in accordance with the stored program. An audible signal alerts the operator at the transmitting location if errors occur in three successive transmissions of the same message.

The IBM 1009 unit can be used with the Model B 1401 card system and Models C and D 1401 magnetic tape systems.

Applications

The 1009 is ideally suited for direct data transmission between a central office and outlying data processing installations to keep the essential exchange of information current and accurate. Data can be sent short distances between local plants, or long distances across the country.

The memory-to-memory transmission between 1401 computers provided by the 1009 can result in substantial savings by eliminating the need for independent, single-purpose transmission terminals and the time and cost of data conversion for transmission with such equipment.

Some typical industries and applications where the 1009 can provide

efficient, timely, centralized control of fast-moving, decentralized operations are: *Insurance*: Premium due notices, Collection reporting, Statistics; *Manufacturing*: Inventory, Production schedules, Production reporting, Cost accounting; *Meat Packing*: Centralized accounting, Sales statistics, Surplus inventory reporting; *Petroleum*: Price checking, Transmission of scientific data, Production reporting, Sales statistics; *Public Utilities*: Revenue accounting, Transmission of engineering data; *Transportation*: Cost accounting, Car accounting, Inventory.

For example, a manufacturing firm having multiple plants, assembly locations and warehouses could make effective use of 1401 computers equipped with 1009 units to make data from each of these locations rapidly available at the central office. By the same token, the execution of home office decisions at local levels can be speeded. As an example, the 1401/1009 could be utilized for inventory control, order processing, and production scheduling by such a firm in the following manner:

Requisition for materials needed by a local facility for fabrication or shipment to a customer are punched into cards at the plant or warehouse. Those items not available in local stock are transmitted from the local facility by 1401/1009 to a 1401/1009 or 7701 at the central office.



The 1009 data transmission unit enables computers to hold direct two-way telephone or telegraph conversations for the first time. Equipped with a 1009, a solid-state 1401 computer can send business or scientific information any distance across the country directly from its magnetic core memory to the core storage of another 1009-equipped 1401. The data flows at speeds up to 150 numbers or letters a second over dial or leased telephone lines or high-speed telegraph lines.

Here, an operator at a 1009-equipped 1401 dials a similar computer at a distant office to establish a direct connection for data transmission. The 1009 is designed for fast, centralized control in businesses having dispersed operations.

Here, a magnetic tape created by the 1401 is compared on an IBM 7070 data processing system against the master inventory tape of the entire company. This determines whether the items are available in stock, either centrally or at another branch, or whether they must be ordered. The 7070 at the central office then produces shipping order tapes which are transmitted to the proper plant, assembly point, or warehouse from which the requisition can be filled. A notice of the action taken at the central office is also sent to the facility which originally requested the material.

This system can also be used for transmitting production figures to the central office to update the master inventory tape. Any resulting changes in production schedules can similarly be sent back to the local plant or assembly point.

Prices

The 1009 unit rents for \$500 a month and sells for \$22,000. A 1009 adapter feature for the 1401 rents for \$100 a month and sells for \$3,750.

Circle No. 31 on reader service card.

New Tunnel Diode

The world's fastest switching device—a radically improved tunnel diode that could conceivably count ten billion one-dollar bills in a second or make computer decisions with equal speed—was introduced by the Radio Corporation of America.

Already, the Department of Defense is studying these new tunnel diodes with a view to developing a computer that will operate at a speed of a billion cycles per second—100 times faster than any computer in existence, according to Kenneth M. McLaughlin, Manager, Computer Products, RCA Semiconductor and Materials Division.

"The device is one of four new types already in production and available commercially," he said. "Because of their tremendous speed, they are expected to have wide use in a variety of electronic systems including data processing, missiles, satellites and various communications equipment. The new diodes will market for \$5.60 to \$22.00 apiece in quantities of one thousand or more."

Tunnel diodes—tiny solid-state de-

vices no bigger than the head of a match—control the flow of electrons that make up an electrical current much faster than an electron tube or a transistor. They are called tunnel diodes because of the manner in which electrons seem to tunnel through them with the speed of light.

"These new diodes operate at incredible speeds," Mr. McLaughlin said. "One of them is fifty times faster than the fastest transistor. As an illustration of their speed, Mr. McLaughlin said the fastest of the new diodes can switch from one voltage to another in the time it takes light, traveling at 186,000 miles per second, to traverse a distance of about one inch.

"Theoretically, then, it is possible for this particular device to switch—or, in popular terminology, 'to make decisions'—ten billion times a second."

Circle No. 32 on reader service card.

Data Converter Series

Fully modular construction is featured in Digitronics Corporation's latest all-solid state data converter, the D300. In addition to tape-to-tape conversion, the D300 series can also have card input and card output. This new series enables the user to specify only those features which he requires.

As completely self-contained off-line equipment it is another step in bridging the gap between the cen-

tral data processor and remote locations.

Paper/magnetic

The D300 immediately converts information between punched paper and magnetic tape in either direction at a rate of 3000 words per minute. The basic unit contains the circuitry necessary to accept data from the input, store data and to feed the data out to the output tapes. The same machine can be arranged for conversion in either direction as determined by switch or plugboard selection. Among the optional features are format control, reordering, translation and increased memory sizes.

Paper tape data may be converted to or from the standard 5, 6, 7 or 8-level configurations. Magnetic tape may be in any code format having up to 6 information channels plus one parity channel with or without a sprocket.

Other options include: end of file insertion which enables the operator to select a special end-of-file code, selective translation, column splits, character insertion and zero suppression. In addition to a magnetic tape handler and paper tape reader and punch, the D300 can couple with a card reader, or a card punch unit.

Checking facilities include the ability to check horizontal and longitudinal parity. A standard 30 ampere 120 V 60 cycle line is the only power required. Prices for the basic unit begin at \$42,000. ■

Circle No. 33 on reader service card.





JOSEPH R. DE PARIS

Evaluating Available Equipment

(This is the concluding article of two in this series. The first article appeared in the September column.)

IN LAST MONTH'S ARTICLE, the pitfalls of overemphasizing hardware in evaluating and selecting data processing equipment were discussed. It was pointed out that the overriding consideration always is to determine which computer is best able to accomplish your job, not which computer has more storage capacity, faster input-output units, and the like. In fact, comparing storage capacities or input-output hardware, without sufficient regard for the entire computer system of which they are part, could deceive one to the extent that faulty conclusions may be formed.

Still another deceptive area is the internal speed of a computer. This refers to the basic processing cycle, e.g. the time to access a character or word in storage or the time to execute a particular instruction, etc. Now there is certainly no quarrel ever with faster processing speeds. The faster we can accept and process data in storage the sooner we can get to inputting another record, printing another line, and writing another record on tape.

Comparing speeds

However, comparing internal speeds of computers must take into account not just the absolute speed or access time, but the number of steps required by each computer to accomplish a given routine. The number of steps multiplied by the average execution time for each instruction may give an answer considerably different from one arrived at by comparing abstract access times.

Incidentally, another consideration is whether the quoted speed is for

one character or for one word. Some machines move one character at a time serially and the time quoted is for access to one character; other machines move data in parallel, a word (ten characters often) at a time, and the quote will be for access time to a word. This fact will naturally affect your calculations.

Tape speeds

Tape speeds — the number of characters read or written per second — are the subject of much concern. Rated speeds of tape units certainly vary from one computer to another. Here again the raw speeds cannot tell the whole story.

To become meaningful, tape speeds must be considered together with access and execution time for transferring tape records to and from storage, as well as the amount of processing time for each tape record. The organization of records on tape is another factor. If short records are a necessary evil, inter-record gaps on tape will be frequent and therefore significant. If longer records can be accommodated, inter-record gaps will be less frequent, hence they will be less significant. In any event inter-record gaps are non-productive areas which take as much time to pass over as productive areas. Accordingly, tape organization affects effective tape speeds.

Keeping perspective

By now it should be abundantly clear that hardware must be kept in proper perspective. Comparing individual components or features is like reading a literary passage out of context; you may draw naive conclusions inconsistent with the facts. Even a study of a complete computer system is unlikely to reveal the truth for which we are searching. After all, the purpose of the study is to select the computer best able to cope with the job being planned. The logic

and approach of one computer may be better for one phase of a job, another computer better for another phase, still another computer better suited to a third phase. More powerful commands of one computer may overcome greater processing speed of another. Unbuffered computers with faster rated speeds for input-output units may actually be slower on certain jobs than buffered computers with slower rated speeds for peripheral units.

Study hardware for the purpose of knowing the systems concept of each computer and how input-output and processing are handled. This will help to narrow the area for consideration. But in order to arrive at a valid conclusion in which you may have confidence, it is essential that the job or jobs be planned for the logic of each computer under consideration. Call in each supplier's representative and define the problem for each. Work with each one in planning and drawing block diagrams for the respective computers. Have each one time out the blocks and write instructions to the extent necessary to validate the logic and timing.

Now study and evaluate the results. If deemed necessary, follow the same procedure for a second or third program you are contemplating. Out of this will emerge the computer which is best suited to your situation. Should doubts still remain, do not hesitate to seek the counsel of a reliable consultant.

This is the safe and sane course to the blessings of modern-day data processing.

General Electric computer

The giant of the electrical industry, General Electric Company, has thrown its hat into the data processing ring. G. E. now is marketing two

(continued on page 44)

HAVE YOU CAUGHT UP WITH AUTOMATED MAIL PROCESSING?



There's a precise reason why
THE PHILLIPSBURG INSERTER
is the most accurate mail processing machine

Accuracy is built into the Phillipsburg Inserter with precision machined parts, skilled craftsmanship and over 35 years of manufacturing experience. Accuracy that adds up to trouble-free mail handling. Large mailing staffs, overtime wages, wasted space and the human errors of hand mail fulfillment are eliminated. The Phillipsburg's exclusive vacuum feed and perfectly timed chain conveyors smoothly process mailing after mailing without costly downtime or missing deadlines. Individual adjustments can be precisely made for even the shortest runs.

Phillipsburg's highly sensitive, full detection system prevents feed failures, double feeds and jam-ups at each station. The double document detector stops the machine if double inserts

are pulled. An envelope censor double checks insertions after material has been placed in envelopes.

Even using a Phillipsburg a few hours a month will produce savings of 80% and more. You'll find it the fastest self-liquidating capital expenditure on your books.

Send for the new Modern Mailing Through Mechanization brochure for complete information on the advantages of automated mailing.

See the new Punch Card Billing
Phillipsburg Inserter
at the N. Y. National Business Show
*automatically inserts and mails
random, multiple punch cards.*

Circle No. 16 on Reader Service Card.



BELL & HOWELL COMPANY
14 East Jackson Blvd., Chicago 4, Illinois

Please send

DP 10 60

- ☐ Modern Mailing Through Mechanization Brochure
☐ A practical application for my business

NAME _____

FIRM _____

STREET _____

CITY _____

ZONE _____

STATE _____

PRODUCTS & SERVICES

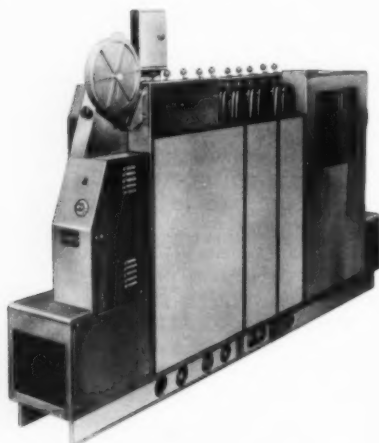
PROGRAMMING PACKAGE

Walter R. Oreamuno & Co., data processing and management consultants of New York city, have developed a standard programming package for the IBM 1401 data processing system.

Pre-packaged programs eliminate individually produced input-output routines, standardize and make interchangeable program sections and subroutines, and establish program standards, in this case to optimize core usage and reduce programming cost.

Oreamuno has also prepared a brochure detailing the program package for the 1401. This includes descriptions of standards, input-output routine, and optional features. The brochure is available upon request.

Circle no. 40 on reader service card.



AUTOMATIC MICROFILM PROCESSOR

A new, completely automatic film processing machine for microfilm was announced by the Houston Fearless Corp. Designated the Microfilm Labmaster, the unit will accommodate either 16mm or 16/35mm film. It is daylight operating and incorporates an extra archival wash for absolute film permanency. Processing speed is variable up to 40 feet per minute.

The new Labmaster has stainless steel tanks and incorporates an alkaline pre-bath, dye back remover, circulating pumps, refrigeration system, film magazines and an advanced-design transport mechanism with

variable speed transmission. The dry box is equipped with infrared heat lamps and an air filter.

Circle no. 41 on reader service card.

ACCOUNTING CENTER SERVICES

A new device that reads perforated figures on coupons accompanying installment payments has just been placed in use by National Bank of Washington in Tacoma. Known as *Cummins Perf-O-Reader*, it feeds the information it reads into accounting machinery to automatically credit customers' accounts for payments received, insuring credit to the proper account and in the correct amount.

National Bank of Washington has been furnishing the electronic books to new loan customers for several months and is now engaged in sending them to several hundred existing installment loan customers every day. It is expected that all accounts will have been converted to the machine-readable coupons before the end of the year.

Circle no. 42 on reader service card.

PANEL PLUG

Although smaller than a regular size cigarette, the Filter Plug introduced by Mac Panel Company solves a kingsize control panel wiring problem, according to the manufacturer.

Back circuits, which formerly required many hours of rewiring to eliminate, are now a thing of the past. The compact Mac Panel Filter Plug provides one-way current flow for self-contacting control panel wiring on IBM data processing machines. The electronic component used in the manufacture of the plugs carries a full warranty against defects in workmanship.

Another innovation in this Filter Plug is that it is a self-contained unit and can be used with any length wires on hand. This eliminates the need for stocking extra quantities of various length wire-with-filter units.

Circle no. 43 on reader service card.

SIX-DRAWER CARD FILE

Just added to the Dolin Metal Products, Inc. extensive line of steel transfer files is this No. G3736, six drawer, economy steel punched card



file, which features nylon glide equipped drawers for easy action and minimum outside dimensions (16-11/16" wide, 12-7/8" high, 24-1/8" deep). This file can be interlocked and drawers interchanged with its companion, two drawer No. G3732, nylon glide card file shown above the six drawer file. Compressor spring follower blocks are available.

Circle no. 44 on reader service card.

POSTING CARRIAGE

The electric typewriter division of International Business Machines Corp. announced the development and availability of a posting carriage for the IBM 632 Electronic Typing Calculator.

The basic IBM 632 is a desk-sized calculator which consists of a modified IBM electric typewriter, ten-key companion keyboard, and arithmetic unit. It is widely used in industry, primarily for the purpose of billing.

The new carriage greatly increases the variety of applications for the 632. The front-feed, split-platen device makes it possible for the 632 to handle invoicing and posting to accounts receivable and accounts pay-

able, inventory accounting, and virtually any other calculating-typing application where it is necessary to maintain a manifest of the work being produced, as well providing a means of inserting forms in front-feed fashion.

The operator can prepare invoices on the left side of the platen and, as a direct by-product of the billing operation, post to customers' statements, ledgers and journals.

Circle no. 45 on reader service card.

SEMINAR ON INFORMATION SYSTEMS

The fifth seminar on Information Systems and Records Management is being presented by the Management Institute of New York University, September 27 through December 2, 1960. The 12 two hour sessions are being held in the American Arbitration Association's Felix M. Warburg Room at 477 Madison Avenue, New York City, from 6:15 to 8:00 P.M. The Tuesday night round table discussions, under the leadership of Milton Reitzfeld, intend to cover the following topics:

The Concept of Information Models (non-mathematical), Dissemination of Policy and Procedure, Business Documentation, Information Feedback, Correspondence Management, Information Distribution, Mechanical Information Systems, Records Retention Schedules, Records Depositories, Protection of Vital Records Against Disaster and Unauthorized, and Disclosure.

Circle no. 46 on reader service card.

BILL OF LADING

Production of a new type of bill of lading, designed for the trucking industry to save truckers nearly 50% of their billing costs, was announced by Controlforms Corporation of St. Paul. Called the Freightrite system, the newly designed bill of lading is made possible through the use of paper printing plates. It will be used by the trucking industry to print all of its paper work for a shipment of goods without ever typing a bill.

The trucking industry has, for over 30 years, labored with billing procedures which have been extremely costly. The company claims the new Freightrite system, when in general use, will afford truckers a better method of handling their billing and at the same time will give

their customers better service.

The new system, endorsed by the American Trucking Association, which achieves *office automation* usually associated with giant electronic computers, requires the shipper to use a bill of lading, one part of which is the newly designed paper printing plate developed by the Addressograph-Multigraph Corporation.

Circle no. 47 on reader service card.

LEASE PLAN FOR EQUIPMENT

A new long-term lease plan covering all typewriter, adding-calculating machine, and systems products has been introduced by Remington Rand.

Announcement of the lease plan was made jointly by Kenneth R. Herman, president of the Remington Rand Division of Sperry Rand Corporation, New York, and Robert Sheridan, president of Nationwide Leasing Company, Chicago. Nationwide will underwrite the program throughout the country.

"This new plan has been developed to meet the needs of both the smallest businesses and giant corporations," Mr. Herman said. "Management can now introduce cost-saving equipment into its offices without expenditure of working capital. For many firms, it will be possible to pay the monthly leasing charges out of money saved by the new equipment."

"Leases can range in size from as little as \$175 for a single adding machine up to hundreds of thousands of dollars for complete office systems," Mr. Herman added. "Where additional equipment is included under a master lease, a single transaction could involve several million dollars."

"Leases will normally range in size from 39 to 65 months. In special situations, it will be possible to draw up agreements for as little as two years or as long as 10 years," Mr. Herman said. "Renewal options are standard for all leases."

The lease plan will be available throughout the country from Remington Rand salesmen and agents. Products included under the lease plan include both standard and electric typewriters, adding machines, calculators, filing and record-keeping equipment, and the company's full line of office furniture used in its systems applications.

Circle no. 48 on reader service card.



MICR BUSINESS MACHINE RIBBON

A new type of business machine ribbon, made of paper, has removed a major barrier to the automatic handling of the billions of checks which pass annually through the nation's banks.

The ribbon, developed by research scientists at The National Cash Register Company, imprints magnetic figures and symbols on checks and deposit slips. Already in use in the Bank of America's *ERMA* automation system, the ribbon will be increasingly employed as other banks begin their automation programs.

Under the MICR system, the depositor's account number is printed in magnetic ink at the bottom of his checks when the checks are prepared at the printer's. A major stumbling block, however, was how to imprint additional information on the checks at the bank. The account number of a check could be pre-printed at the printer's, but the amount for which the check was written would vary with each check. Also, there was the problem of how the bank could print a magnetic account number on checks for new depositors until their regular supply of pre-printed checks could be obtained.

The technical difficulties of printing magnetic characters with conventional-type business machines—numbers whose quality would compare favorably with those produced on printing presses—were extremely complex.

The ribbon that solved the problem is made of special paper and is coated with a magnetic material which meets the required physical

characteristics. When the typeface in the business machine strikes the ribbon, all of the coating at the point of contact breaks free from the ribbon and transfers to the surface of the check. The typeface thus acts as a miniature cookie cutter, depositing on the check a magnetic coating in the shape of the individual numbers and symbols. Each number and symbol has the sharp definition and perfect magnetic properties required for automatic machine reading.

Circle no. 49 on reader service card.

MONOSCOPE CHARACTER GENERATOR

Deep-seated interest in fast read-out of computer generated data attracted more than 125 executives, engineers, and technicians to an official open house of the new A. B. Dick Research and Development Laboratory in Palo Alto recently.

Capabilities and plans of the new laboratory were described and demonstrated as well as the two most recent developments of the A. B. Dick Videograph process, capable of printing or displaying at rates up to 20,000 characters per second.

First of these two developments is a practical, production model of a low-cost, compact monoscope character generator. The character generator is used to convert digital pulse codes into video signals which can

then be displayed or printed instantaneously.

Second of the developments is the announcement of a new console display system which can be used for data retrieval. A screen in the system allows the operator to browse through material stored on punched tapes or cards or on magnetic file tapes. When the screen reveals material which proves to be useful currently, the operator places Videograph paper in a slot in the surface of the console and a copy issues from the front of the unit, in seconds.

Circle no. 50 on reader service card.

TAPE CONVERTER

The missing link in many punched tape data processing applications is an efficient method for converting one tape coding system to another to operate different but allied equipment. Because of this, Friden, Inc., developed the Punched Tape Code Converter to integrate all systems code variations.

Specifically, with the Friden code converter, any 5-, 6-, 7-, or 8-channel code system may be converted, one to the other. This means, for example, that any data in an 8-channel tape being produced by a Friden Flexowriter automatic writing machine can be wire-transmitted by automatically repunching codes in 5-channel tape on the Code Converter. At the receiving end of the line the



codes may be converted back to 8-channel again, or even 6- or 7-channel, depending upon the requirements of the application.

Some of the most common uses for the Converter include tapes for Graphotype address plate embossing, computer input, machine tool control, and operation of Friden systems machines. Also the unit can be obtained with a special punch and reader which will enable tapes to be converted for Teletypesetter operation.

By means of a plug-type control panel, consisting of 832 double-outlet hubs or patch points, the code converter is preset at the factory according to the customer's particular input-output requirements.

Tapes are read at 1180 codes per minute, and widths of 11/16", 7/8" or 1" are acceptable. Simple adjustments are incorporated for changing one width to another. Parity check is a standard feature, as well as a built-in code check to insure that an output code is punched for every code read.

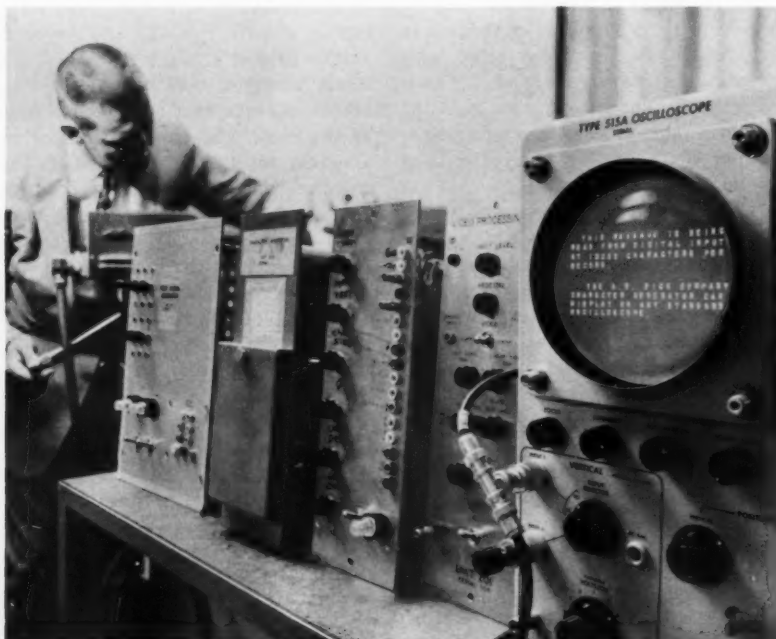
Circle no. 51 on reader service card.

TAPE CLIP

A plastic clip that slips smoothly between the flanges of reels to hold loose ends of magnetic tape securely in place has been developed by Minnesota Mining and Manufacturing Co.

Called the "Scotch" brand Tape Clip, the thimble-sized product is being merchandised in packages of 10 at a retail price of 35¢. In addition one of the clips soon will be packed with each roll of "Scotch" brand magnetic tape.

Molded of polystyrene plastic, the triangular-shaped accessory is sturdy yet flexible and easily clips onto tape



on reels. All edges are tapered and smooth to prevent any possibility of scratching the tape. The clip was designed as a simple and quick means of keeping tape on either partial or full reels from tangling or unwinding during storage and shipment. Produced only in one width, the clip fits standard quarter-inch recording tape on any size reels.

Circle no. 52 on reader service card.

PUSH-BUTTON FILING

A new Electro Kardex file, capable of bringing the speed and efficiency of push-button filing to any office where visible records are or can be profitably employed, has been announced by the Remington Rand Systems Division of Sperry Rand Corporation.

Styled and designed to fit into the most modern office decor, the Electro Kardex is the only mechanized visible file on the market. Literally all visible records applications can be made more efficient with the new unit: inventory control, personnel records, purchasing, and records controlling credit, production, costs, sales, etc.

The Electro Kardex is a self-contained work unit. The operator pushes a button on the selector panel before her to get any one of the more than 4,000 records within the unit. In an average of four seconds, a slide containing that record automatically positions itself in place before her, at perfect posting level. A quick visual run down of the exposed edges of the Kardex pockets brings her to the specific one she wants; a final quick flip with her

finger exposes the complete record.

Depending on the specifics of each situation, mechanized visible filing has speeded the posting-reference process by as much as 50% where it has been introduced. In addition, it has often helped meet a space problem, for manual filing cabinets cannot accommodate thousands of cards in so small a space as can a mechanized unit.

Circle no. 53 on reader service card.

FILING DATA TAPES

Dresser Products Incorporated makes it possible to file punched

paper tapes in single and twin pocket envelopes in conventional punched card files. These envelopes are lined with polyethylene to prevent bleeding of the oil in the tapes. They may be used in either vertical or horizontal position to fit your present files.

Circle no. 54 on reader service card.

PROGRAM LIBRARY

IBM's Programmed Applications Library has been augmented with programs written for the brokerage industry for the 7070 and 1401. In the brokerage business, the purchase



companion piece to your data processing...

APPLIES LABELS

pre-addressed from card or tape

TO ALL TYPES OF PRINTED PIECES

CHESHIRE **MODEL E**

Automatically applies up to 16,000 labels per hour to post cards, envelopes, insertion cards, pamphlets, brochures... lightweight booklets, magazines, catalogs and quarterfold tabloids. Applies roll strip, continuous pack form and tape strip labels, pre-addressed from punched cards, magnetic tapes, plates, stencils and other addressing systems (even applies cut or individual labels). Compact... and so simple it can easily be operated by your own personnel. Time purchase plan, if desired.

Write for descriptive Model E brochure

CHESHIRE INCORPORATED

DEPT. DP-81644 N. HONORE ST.

CHICAGO 22, ILLINOIS

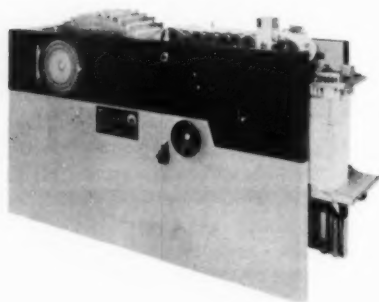
Circle No. 11 on Reader Service Card.

and sale application represents the daily sales activity, stock record is the daily inventory, and margin is the credit status.

Purchase and sale, as well as stock record, are complete programs because procedures on these applications are generally similar throughout the brokerage industry. The margin accounting, cash account maintenance and bookkeeping logic routines define the major part of a brokerage firm's complete margin accounting program. Additional program steps can be written by individual brokerage houses with special needs.

Other programs included in the Library are public utility customer billing and accounting program for the 7070 system, and an IBM Ramac 305 hospital accounting program.

Circle no. 55 on reader service card.

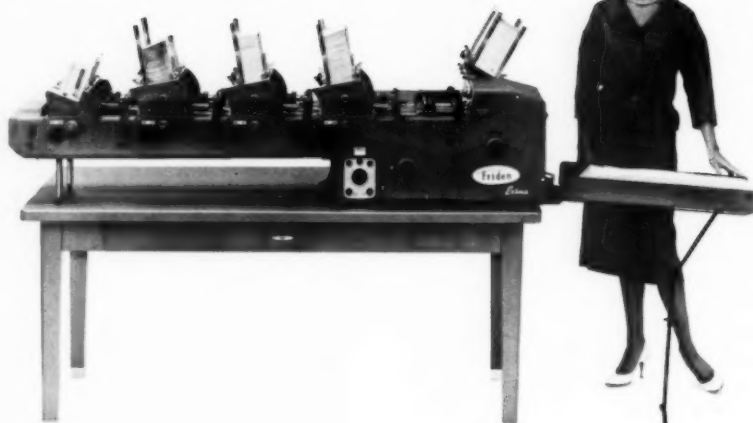


"ROTOMATIC"

Several innovations intended to improve the appearance and operation of Thomas Collators' fully-automatic, 50-station *Rotomatic* collator have recently been completed.

Controls have been repositioned for greater ease of operation, and smaller paper flow has been assured by simplified guides that receive sheets earlier in the collating cycle. Design has been modernized in accordance with the recommendation of a prominent industrial designer while color has been changed to reflect the latest trend to harmonies of grey.

The collator's features include: a unique push button programmer that allows different collating jobs to be run at the same time; a miss and double detector that automatically points out the source of error; and an accessory stitcher that automatically staples each collated set. The *Rotomatic* collates, counts and stag-



gers at a rate of from 14,000 to 25,000 sheets per hour.

Circle no. 56 on reader service card.

MAIL INSERTER

The latest version of the Friden-Ertma Mail Inserter takes envelopes up to 9 $\frac{5}{8}$ " long by 6 $\frac{3}{8}$ " deep, or as small as 3 $\frac{3}{16}$ " square. At speeds of up to 6,000 envelopes per hour, it will gather and stuff as many as eight inserts, then seal, count, and stack the envelopes, ready for mailing.

The basic machine has one feeding station, however up to seven additional stations may be attached at any time, including those for tabulating and open feeding. Any station may be switched off when not wanted without hindering the operation of the other units. Detecting systems in the Friden-Ertma permit it to handle all weights, thicknesses, and surface finishes of paper stock.

Unlike many other inserting machines the Friden-Ertma can pick up punched cards by means of an exclusive *knife-feed* device, no matter how many holes have been punched in the cards.

Literally one finger replaces 16 hands: simply by pressing a button to start the machine's continuous, automatic action, a single operator accomplishes a task normally requiring at least eight people. The Friden-Ertma Mail Inserter is set up easily, with all the proper adjustments, without tools.

Circle no. 57 on reader service card.

ALGEBRAIC COMPILER

Computers have been brought directly within reach of every engineer by introduction of the ALGO algebraic compiler. Developed by Bendix Computer Division, ALGO will allow anyone with a knowledge of high school algebra to program engineering problems as they are being analyzed.

ALGO is a universal language programming system patterned after the proposal of the Association for Computing Machinery and other members of the ALGO committee. Its close parallel to algebra allows inexperienced programmers to solve problems on the computer with the aid of a self-teaching manual that makes previous knowledge of computers and programming techniques unnecessary. The simplicity of ALGO can be seen by comparing the following program with the number of steps required to solve the same problem on a slide rule, desk calculator, or any other computing device.

PROBLEM: Generate a table giving the solution of the differential equation

$$\frac{dy}{dx} = \sin x + y. \text{ (Starting values } x = 0, y = 0. \text{ Ending values } x = 1, y = ?)$$

ALGO PROGRAM:

```
BEGIN (S)
dx = .001 (S)
y = 0 (S)
FOR x = 0 (.001) 1 BEGIN (S)
y = y + dx * (sin x + y) (S)
```

PRINT (FL) = x + .001 (S)
 PRINT (FL) = y END (S)
 * CARR (1) (S)
 END (S)
 * Carriage return

Completely self-contained, ALGO has facilities for computer control, input and output, program preparation, operation, and check-out. With insertion of the routine into the computer, all instructions and data are handled automatically.

The ALGO compiler is available at this time to Bendix G-15 users. The self-teaching ALGO manual is available to both users and non-users on request.

Circle no. 58 on reader service card.

SPRINT

Credited with the high speed data searching ability of a large scale computer at a cost saving of up to fifty percent, the device indicated here by James E. Guertin, (right) Chief Engineer of the University of Pennsylvania data processing center, is an EDP newcomer known as SPRINT (short for selective printing). SPRINT rapidly selects specific data from long files on magnetic tapes and passes it to the Univac High Speed Printer for preparation of one-time management reports. Until now this was possible only on full scale computers at greatly higher cost. Major Arthur Hill, Director of Data Processing at the United States Marine Corps Supply Activity in

Philadelphia, here discusses the merits of SPRINT with Mr. Guertin. The Activity is now using this device and Major Hill says that it has enabled the preparation of routine stock status reports in two thirds the time previously required. He also indicated that the unit makes it possible to obtain reports formerly unobtainable because of cost or time limitations. The Marine Corps Activity plans to put SPRINT to work on readiness reports (the readiness of the depot to provide logistic support of troops). Several other uses are anticipated for the device which has been acquired by Univac Division of Sperry Rand Corporation from its developers, the Associated Consultants of Philadelphia.

Circle no. 59 on reader service card.

LIT-SWITCH

Color-Lite's new Push Button LIT-SWITCH (lighted push button switch), for dry circuit to 3 amps operation, is designed for use in computers, data and message handling, missile ground support equipment, machine tool control and process control wherever an indicating switch is required. Available single pole to six poles, double throw or single throw, Model 801 LIT-SWITCHES are easily installed.

Circle no. 60 on reader service card.

■ ■ ■



Coming Events

Oct. 22-26

Controllers Institute of America
 29th Annual National
 Convention, Hotel Fairmont
 San Francisco, Calif.

Oct. 26-27

Computer Application Symposium
 sponsored by Armour Research
 Foundation, Morrison Hotel
 Chicago, Ill.
 Contact: Andrew Ungar, Armour
 Research Foundation
 10 W. 35th St., Chicago 16, Ill.

Oct. 31 - Nov. 2

13th Annual Conference on
 Electrical Techniques in
 Medicine and Biology,
 sponsored by ISA, AIEE, IRE
 Sheraton Park Hotel,
 Washington, D. C.
 Contact: Dr. R. L. Bowman,
 National Heart Institute
 Bethesda 14, Md.

Oct. 31 - Nov. 4

Institute on Electronics in
 Management, sponsored by
 American University School of
 Government and Public
 Administration.
 The American University,
 Washington, D. C.
 Contact: Dr. L. H. Hattery, The
 American University
 1901 F St., N. W.
 Washington 6, D. C.

Nov. 1-4

Business Equipment Exposition
 sponsored by Office Equipment
 Manufacturers Institute.
 Memorial Sports Arena
 Los Angeles, Calif.
 Contact: OEME office,
 777 14th St. N. W.,
 Washington 5, D. C.

Nov. 3-4

Third Annual National
 Conference and Technical
 Exhibit of the American
 Production and Inventory
 Control Society
 Sheraton-Cadillac Hotel
 Detroit, Mich.
 Contact: National headquarters,
 330 S. Wells St., Chicago 6, Ill.

Evaluating Available Equipment

(continued from page 36)

computer systems, the GE-210 and the GE-225. The 210 is of about the same capacity as the IBM 7070. Twelve systems are installed, operating as tape systems with MICR input.

The recently announced GE-225 is a medium-scale, solid state, new-generation computer. It is designed to compete with tape systems such as the IBM 1401, RCA 301 and 501, and possibly even with smaller configurations of the IBM 7070. There is a working prototype in existence now and first deliveries (to a GE activity) are expected to be made within one year.

The central processor has a magnetic core memory with increments of 2048, 4096, 8192 or 16,384 binary words. Each binary word has 21 bits — 19 data, one parity, and one sign bit. Each binary word is the equivalent of $5\frac{1}{2}$ decimal digits. A typical memory of 8192 words roughly would handle a program of 5000 instructions at one word per instruction with about 3000 words available for data.

Internal speeds

Internal speeds seem unusually fast for a computer of the order of the 225. The basic cycle is 40 microseconds. All arithmetic operations are done in binary which requires a programmed conversion of decimal digits to binary. Despite this, the effective internal speed of the 225 compares more than favorably with other computers in its class. One programmed routine now available converts six character decimal information to binary in eight milliseconds. On an input card perhaps 25% of the data would have to be converted. In such a case about 32 of the 150 milliseconds card read time would be occupied with conversion. Conversion from binary to decimal can be done more rapidly.

The GE-225 is a completely buffered on-line system. It is capable of simultaneous read-write-compute on all peripheral units. Cards and tape, for instance, can be reading or writing simultaneously via time sharing. The system accommodates input-output on punched cards, magnetic tape, paper tape; in addition, MICR documents can be read. Mass random ac-

cess memory and auxiliary drum storage are also available.

The card reader is rated at 400 cards per minute, the card punch at 100 cards per minute. The high speed printer operates on-line at 600 lines per minute. All three utilize control panels for format control and limited edit control of printed data. An off-line high speed printer at 1000 lines per minute is available as well.

Magnetic tape features

Magnetic tape is compatible with 727 and 729 tape drives. Tape can be written in pure binary or in BCD code. Two heads are provided, one for writing, the other for reading, allowing immediate check of output tapes. Magnetic tapes will be able to read backwards as well as forwards. As many as 64 tape drives can be connected to the system.

Random access disc storage will be provided by a Telex unit with a capacity of over 75 million characters and access time of 150 milliseconds. Three index registers are standard equipment to facilitate programming and conserve storage space.

A card system consisting of console, typewriter, reader, punch, and 2000 word memory, rents at about \$3800 per month. A tape system consisting of console, typewriter, card reader, card punch, line printer, tape control unit, six tape drives, and 8000 word memory rents at about \$10,400 per month.

The advantages of the GE-225 are in its ability to expand, its large core memory, and its range of peripheral equipment, including a random access unit. The fast, powerful central processor, completely buffered between itself and auxiliary units, is even faster because of the ability to read-write-compute simultaneously.

The GE-225 represents an important contribution to data processing. It is a welcome addition to the new generation of improved, yet lower cost computers. ■

Management's Challenge . . .

(continued from page 24)

and error, and plenty of black coffee.

Block diagramming, flow charting, procedure writing, programming, wiring, coding, logic. It's the only

way to talk to a data processing system. The more effectively this language is communicated to you, the more effectively you'll be able to communicate in turn.

And in this business, my poor overworked data processing specialist, if you don't communicate you're dead. ■

Notable Quotes

"When you come to quiz your people on what they are doing probably they will talk about mechanizing payrolls, producing invoices at phenomenal speeds and the like. Very impressive, you will think — but you need to have a few barbed questions in your quiver: are they looking into sales analysis (who sells what, when and how), inventory analysis, forward buying and forward planning? In other words there is a distinction between improving paperwork and providing information." *Comment, Automatic Data Processing, July, 1960.*

"Business is a world of reports and conferences and communication without end. Lack of communication skills is by far the biggest shortcoming of college graduates. In a company-wide survey of more than 13,000 college graduates, English was the most helpful subject among non-engineers and ranked second only to mathematics among engineers." John Spencer, General Electric executive. *University of Michigan Business Review.*

"In companies where management-employee relations are in need of overhauling, the problem of preparing a handbook by management often has a beneficial effect.

"As sections of the handbook were contemplated, it was found in case after case, that decisions had to be made so that clear-cut policies could be set down in the manual. Although we didn't realize it at the time, we were really going through a process of mental housecleaning so we could be more consistent and friendly with our employees." Eileen Goodman, "How Effective is Your Employee Manual." *Office Administration, July, 1960.* ■

PEOPLE AND PLACES

AMERICAN HEADS INTERNATIONAL

The United States Representative, ISAAC L. AUERBACH, has been elected President of the International Federation of Information Processing Societies in Rome, Italy.

Eleven member nations of IFIPS each sent a delegate representing all of their country's technical societies to the meeting to plan the next International Conference on Information Processing, to be held in Germany in 1962, and to prepare global coordination in other activities in the rapidly growing information processing field.



AT REMINGTON RAND

JOHN T. JACKSON is the new vice president-management planning for Remington Rand Division. Mr. Jackson is a graduate of Cornell University with a BS in administrative engineering.

CLARENCE E. WATSON is now director of industry marketing for R-R.

At the Dayton Univac office JACK JENEFSKY is manager.

CHANGES AT BURROUGHS

T. MAURICE BUTLER, GEORGE B. HOLMES and BRIAN W. POLLARD have been appointed assistants to the vice president of manufacturing and engineering of Burroughs Corporation.

Butler, named director of engineering, has responsibility for the engineering aspects of general products manufactured by the division. Holmes, new director of administration, is responsible for the division's financial and economic interests, including budgeting and cost control. Pollard, named director of engineering, is responsible for the engineering aspects of data processing

systems manufactured by the division.

AT ACCO

G. DONALD MURRAY III, executive vice president of Acco Products, has been named active operating head of the Acco companies and has taken over the day by day executive direction of Acco Products, Acco Canadian Co., Ltd., and Acco International. THEODORE S. GARY has been elected president and chief executive officer of the Acco Companies to succeed Robert Morris.

STANDARD REGISTER CHANGES

HARRY I. CRAMER and VICTOR D. SHROYER have been named to new positions within the sales development and public relations division of The Standard Register Company. Mr. Cramer and Mr. Shroyer will be, respectively, printing production manager and sales promotion manager.



METHODS SUPERVISOR

JAMES N. LEGGETT of Tidewater Oil Company has been named methods and systems supervisor for the western division. He had been assistant methods and systems supervisor, and before that a systems analyst for the Flying A company.

ARLINGTON RESEARCH CENTER

C-E-I-R, Inc., announced that J. PAUL WALSH has been appointed director of the company's Arlington Research Center, the largest independent commercial computing center in the nation. Dr. Walsh was promoted from his position as Director of the Space and Weapons Systems Division at C-E-I-R.

Prior to joining the research and computer services firm in February

1960, Dr. Walsh was deputy director of Project Vanguard, organizing and managing the Vanguard operations at Cape Canaveral and directing the operation that launched the first Vanguard satellite into orbit.

HEADS NEW IBM INSTITUTE

THOMAS E. CLEMMONS has been appointed director of advanced studies by International Business Machines Corporation. He was director of the company's executive development program. Mr. Clemmons will continue to direct all executive development activities of the company. In addition, he will be responsible for the administration of IBM's Systems Research Institute scheduled to open this fall.

AT RCA

CHARLES M. LEWIS has been appointed manager of the industrial computer systems department of the EDP division of Radio Corporation of America.

J. WESLEY LEAS has been named manager, data communications and custom projects department of the EDP division.

BENDIX DIRECTORS

F. J. BORHECK, formerly aviation sales manager, is now director of aerospace marketing.

B. D. CARTER, former merchandising manager, has been moved to director of automotive marketing.

DASHEW

RICHARD S. BRILL, of Hunter Engineering Co., has been elected to the board of directors of Dashew Business Machines, Inc.

JOHN H. HUMPHREY has been appointed vice president of management engineering and planning at Dashew.

PIONEER FORMS

WILLIAM G. STINE has been named assistant to the president of Pioneer Business Forms Inc., Tacoma, Wash. Mr. Stine, a University of Washington graduate in business administration, has been with Pioneer two and one half years in the Seattle sales office. ■

OUTPUTS

ITEMS OF INTEREST FROM HERE AND THERE

HOSPITAL AUTOMATION CENTER

Lexington, Kentucky, will be headquarters for an unusual automation center which will provide electronic computer service for hospitals and clinics throughout the southern part of the United States.

The service is aimed at hospitals up to 300 beds in size, and is slated to be in operation late next year. The new service will be built around an NCR 390 electronic computer, manufactured by The National Cash Register Company. The NCR 390, recently unveiled, is the first computer able to read and process a conventional-type business document.

Under the new plan, hospitals and clinics will simply mail to Lexington punched paper tape records of their daily transactions. The punched tapes are created automatically by specially wired NCR cash registers, accounting machines and adding machines used for routine record-keeping at hospitals and clinics. The tapes will be processed automatically by the computer and reports sent back.

BENDIX G-20 USERS CONFERENCE

The Bendix G-20 Users Group met for its second conference on July 6 at The Bendix Corporation, Bendix Products Division, South Bend, Indiana. Approximately 50 representatives attended.

George Brown, director of the computer center at the Division, was named acting chairman. Tak Yamashita, manager Applications Section, will represent the Computer Division in coordinating activities. In addition, the following ad hoc committees were organized: Standards, By-Laws and Nominating, and Data Processing.

The remainder of the meeting was devoted to analysis of programming systems for the G-20 computer. The next meeting will be held in Los Angeles in the latter part of the year.

MICR

With the U.S. financial industry's new common language program rapidly gaining momentum, Burroughs Corporation will deliver nearly 50

electronic sorter-readers to some 25 banks before the end of the year. Several institutions will take delivery of two to four units this year.

Magnetic Ink Character Recognition (MICR), adopted by the American Bankers Association as its common machine language, has not been confined to the financial industry alone. Burroughs has contracted to deliver MICR equipment to handle data processing tasks for a hospital, a financial publishing company and an engineering institute, among other commercial applications.

SPACE AGE COMMUNICATIONS

A contract to investigate radio communication problems involved in landing an unmanned space craft on the moon has been awarded to Collins Radio Company by McDonnell Aircraft of St. Louis, Missouri.

Collins Radio researchers will study the best approaches to be used in providing enroute and terminal radio communication facilities such as tracking, ranging, radio communications, encoding and transmission of the scientific data.

The moon landing space craft is intended to make a *soft landing* on the moon and relay to earth scientific data regarding conditions on the moon. The over-all program is sponsored by the Jet Propulsion Laboratory of the National Aeronautics and Space Administration as part of its continuing plan on the exploration of the moon. McDonnell is one of four companies selected to conduct a five-months study leading to a program to soft land an instrumented space craft on the moon.

NASA ECHO I COMMUNICATIONS SATELLITE

The National Aeronautics and Space Administration ECHO I passive communications satellite launched at Cape Canaveral, was directed into its selected circular orbit by the Bell Telephone Laboratories Command Guidance System. Bell Laboratories is teamed with Remington Rand-Univac who developed and produced the computer used in the guidance system.

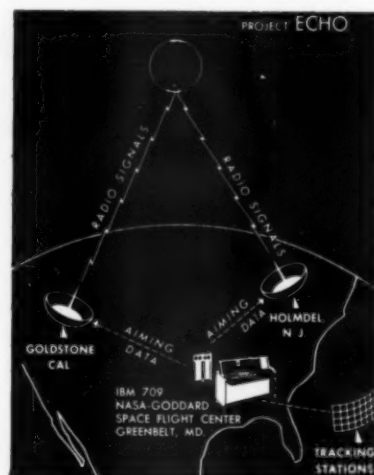
Developed for the Air Force Ballistic Missile Division for use in the TITAN intercontinental ballistic missile, the command guidance system is well suited for space experiments, such as ECHO, where very exact control is required to obtain the desired orbit. This is the same Command Guidance System used to place the NASA TIROS I weather satellite into its precise circular orbit.

COMPUTER AND ECHO

An electronic computer at NASA's Goddard Space Flight Center, Greenbelt, Md., catches the ECHO communications satellite on the fly each time it circles the earth—as part of an experiment that may some day lead to global TV and new forms of world-wide communications.

The computer—an IBM 709—aims radio equipment from the east and west coasts on the gas-filled sphere during its speedy 16-minute crossings of the United States. Accurate aiming depends upon how precisely the computer can predict the satellite's position in the sky.

The experiment, the first in a long-range space communications program initiated by NASA, calls for bouncing radio signals off the 100-foot plastic sphere between the Jet Propulsion Laboratory in Goldstone, California and Bell Laboratory's fa-



A ultra-fast IBM computer at the NASA-Goddard Space Flight Center in Greenbelt, Md., aims radio antennas on both coasts at the ECHO satellite and tells scientists when to bounce signals from the huge 100-foot gas-filled sphere. Drawing is an artist's concept showing how the computer feeds aiming data to the two antennas. The big dishes flash messages to one another via the ECHO satellite in a transcontinental experiment which may lead to global communications systems for TV, radio, telephone and telegraph.

cility at Holmdel, New Jersey.

Like a duck hunter leading its quarry in flight, the IBM 709 computer predicts that precise point in time and space when the communications stations must lock on ECHO if they are to bounce their radio signals successfully from one to the other.

The satellite presents a fast-moving target. It travels from west to east at approximately 16,000 miles

per hour in an orbit nearly 1,000 miles high.

Within minutes after launching of the three-stage rocket that carried ECHO into orbit from Cape Canaveral, the computer in the Goddard Space Flight Center prepared a preliminary orbital timetable on the basis of sightings from the Atlantic Missile Range. These were relayed to California and New Jersey while the satellite sped around the far side

of the earth. Other orbital predictions are being prepared in NASA's Center and transmitted throughout the world where they will be used by experimenters interested in having a trial bounce of their own off the aluminum-coated sphere.

During twilight—just before dawn and just after dusk—the inflatable satellite is visible to the naked eye. It is seen as a brilliant star moving across the sky. ■

DATA . . . yours for the asking

For your convenience in obtaining pertinent and helpful information on the latest equipment, forms, services and related products in the data processing field, we direct your attention to the following free literature available from the manufacturers. Circle the numbers pertaining to the literature you wish to receive on the Reader Service Card appearing elsewhere in "DP."

GET MORE RESULTS FROM YOUR SYSTEM is a new booklet put out by UARCO Inc. describing forms and card sets designed especially for those companies using cards both as a form and then as input into their data processing system.

Circle no. 70 on reader service card.

CONTROL TAPE for machine tool control and data processing applications is detailed in a data sheet available from National Vulcanized Fibre Co.

Made of vulcanized fibre, Peerless Fibre control tape has toughness, durability, a low stretch factor, and high opacity. It resists rough handling even in the machine shop where paper tape is too flimsy for repeated use. Peerless fibre tape is better suited for continuous cycling and for master tapes.

The physical properties and specifications of this control tape are outlined. Also included is complete information on prices, quantities available, colors, sizes, and delivery.

Circle no. 71 on reader service card.

"WORK ORGANIZERS FOR THE 60'S" is a new 32-page brochure in

which Wassell Organization, Inc. presents its 1960-61 line of horizontal rotary files and rotary-file desks.

With five pages of office floor plans and 14 pages of case-history photos and drawings, the booklet shows personnel and space-saving factors for Wassell Corres-Files, Open Corres-Files, Rotor-File Desks (single, dual and multi-position), Spring-Dex Card Rotor-Files and Desktop Rotor-Files to bring the work to the worker.

Circle no. 72 on reader service card.

MULTIPLEXER, the TMX 841, is a solid state high speed electronic switching instrument used for scanning a multiplicity of channels. The equipment is described in an Epsco bulletin. Transfer accuracy of $\pm 0.01\%$, cross-talk down 120 db, and flexibility of channel capacity provided by plug-in printed circuit cards, make this unit ideal for precision instrumentation systems. Its utility for the system designer is further enhanced by patch board programming and high input impedance.

Circle no. 73 on reader service card.

FIVE TECHNICAL PAPERS presented by Epsco personnel at the National Telemetry Conference held in May at Santa Monica, California are available:

PCM Synchronization, William H. Seaver. 11 pages

Discusses the problems of synchronizing the telemetry receiving station to the data format of the transmitter, so that the incoming digital data words are sorted into their proper data output channels. Several synchronization techniques,

with their relative merits and shortcomings, are discussed.

Circle no. 74 on reader service card.

The Universal Computer Language Recorder—A General Tool for Telemetry Data Handling, John D. Bassett. 15 pages

Discusses the applications, design considerations, logic, and capabilities of the Epsco S-2000 Computer Language Digital Recorder as it is used to reduce telemetered PCM data directly into computer format.

Circle no. 75 on reader service card.

Data Transmission for Industry, William F. Kamsler. 11 pages

Surveys the general field of data transmission, pointing out recent advances in digital techniques made in military projects, and the promise held by application of these new techniques of high-accuracy to data gathering and transmission, making feasible the real-time automatic control of industrial processes.

Circle no. 76 on reader service card.

Instrumentation System for Psychophysiological Studies, Harold S. Goldberg. 9 pages

Describes a system used to collect high-accuracy data during physiological and psychological studies of living subjects, and to record the data in computer format for direct entry into a general purpose digital computer for analysis and study.

Circle no. 77 on reader service card.

Portable Data Handling System, Richard A. Ferrero. 3 pages

Briefly describes a high-speed data gathering system packaged in small, portable cases for the acquisition of data on board submarines, and the associated land-based equipment which reformats on magnetic tape the data recorded at sea and presents these data directly into the high-speed input of a Univac computer.

Circle no. 78 on reader service card. ■

CLASSIFIED

Accessory Equipment

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Used Equipment

FOR THE BEST PRICE contact us on Used Data Processing Equipment. We buy & sell IBM control panels & wires, IBM & Remington Tabulating Equipment, Card Housing Equipment (All types and makes). Consult us on your systems conversions. Universal Business Equipment Co., 533 S. Dearborn St., Chicago 5, Illinois, HArrison 7-4878.

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Have you a favorite programming trick, gimmick, or shortcut that you want to share with our readers? Write it up in 300 English words (or less) and submit it. We will pay \$10.00 for each one used.

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These positions open now!

Send a brief resume of personal and work history to Box 232, in care of Gille Associates, Inc., 22nd Floor Book Tower, Detroit 26, Mich. All replies will be answered.

Seen in Print

WHY DOESN'T THE OFFICE PAY ITS WAY? Modern Office Procedures, August, 1960.

American business gets less than half its money's worth from the dollars it pours into office operations. White collar workers produce only 30-50 percent of what they should be doing. While blue collar workers increase output about 2½ percent a year, office workers are outputting at World War II levels.

While measurement standards and incentives are applied at the factory, in the office all problems are met by adding personnel.

A GAME TO IMPROVE SALES EXECUTIVES. Automatic Data Processing, June, 1960.

If you want to take decisions without burning your fingers this will teach you business strategy to apply in real situations.

Since games (exercises which simulate business conditions through mathematical models) were introduced four years ago, there has been increasing interest in developing simulations for specific aspects of business activity and even for specific industries.

These are effective educational devices.

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BOOK SHELF

HANDBOOK ON DATA PROCESSING METHODS, Part I (provisional edition), prepared jointly by Statistical Office of the United Nations, New York, and Statistics Division, Food and Agriculture Organization of the United Nations, Rome. Columbia University Press, 2960 Broadway, New York 27, N. Y., 1960, 110 pages, \$1.00

The preparation of these studies has been undertaken to assist less developed countries in processing statistical information. Very little suitable information on the subject exists in easily available form, and it was felt that a series of studies on the most important aspects of data processing would be of use. Twelve studies are contemplated, five have been completed and are included in this first paper bound book.

The five sections included are: scope and principal methods of data processing; planning, organizing and administering data processing services; the elements of planning and operating a punched card installation; manual methods and tools for data processing; and punched card sorting.

Those sections yet to come will deal with: source documents—their design and location; codes and coding techniques; punched cards (types and design); punching and verifying; auxiliary punched card machines; punched card tabulating machines; supervision of a machine department.

All the studies should be useful to professional statisticians; the major part of the first three sections has been prepared primarily for government officials who may be unfamiliar with statistical methods and data processing techniques, to get some background for decisions on financing, organizing, and administering such installations.

The remaining studies will be published when completed. Eventually the entire study will be collected in one volume and will deal with methods and other processing aspects. The remaining sections are mainly for the use of supervisory personnel of processing services, and for statisticians.

The emphasis in these studies is on punched card methodology. No attempt is made to evaluate the relative merits of the various available machines. However, there is a list of international offices of those manufacturers making punched card equipment for those who might wish to query them.

Books and periodicals, both those put out privately and by governments of the United States, Canada, England, and France, have been searched for background material in this study, if the footnotes are an indication.

Mention is made briefly of electronic computers, but the subject is not pursued as it is outside the scope of the present study.

The material is clearly and logically presented and should be helpful to those who do not know much about this field.

INTEGRATED DATA PROCESSING by H. John Ross, Office Research Institute, P. O. Box 744, Miami 43, Florida, 1960, 80 pages, \$2.00.

This small book discusses savings possible through integrated data processing, whether clerical manual or electronic. The author points out that the departmentalization of paperwork is expensive, with everyone having to duplicate writing of forms, handling, and increasing chances of errors in the many transcriptions. While he does not deny the savings possible with the installation of electronic data processing, he believes that it is the broadening of the base and the integration that brings about much of the savings. The speed of the machine helps where there is a great volume, but even a small office would benefit by reviewing its paper handling, improving forms, cutting down duplication of effort.

HOME STUDY COURSES

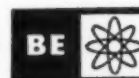
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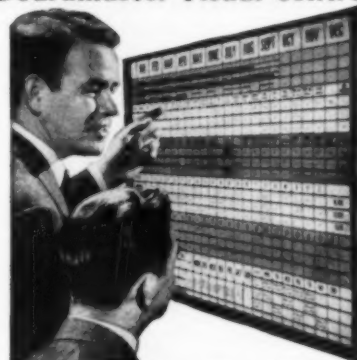


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e d i t o r i a l

AS PAPERWORK AUTOMATION CONTINUES ITS PHENOMENAL GROWTH, and there is every indication that it will, office workers at all levels feel their job security threatened. Nothing in the past has prepared them for this change, for even the advent of punched cards caused little basic change in the office.

Technological changes today are more sophisticated; they reach far deeper into the very organization of business and industry. Departmental lines have been crossed, organizational charts have been ignored and operating executives uprooted. Even some of the heretofore sacred executive positions of middle and upper level management are disappearing!

In the early stages of paperwork automation it was entirely up to the equipment manufacturers to teach the use of their products. Educational institutions were, at that time, totally unaware of or indifferent to these new *office gadgets*. Therefore, training courses by the manufacturers were hastily devised and resulted in many errors in judgment. Company instructors were ill equipped to cope with the job of teaching mature business executives. While considerable technical and engineering information was available, it was a nightmare of unknown terminology to the businessman charged with the conversion of his company to modern data processing. Consequently many early installations suffered from this lack of sound business information; several well publicized computing systems dropped by the wayside in this chaotic period.

Today many of our colleges and universities offer graduate courses in data processing and allied areas; most of these programs are excellent and promise a supply of qualified graduates. And supplementing the more formal educational process are private institutes, most of which are operated by competent educators who are well informed on all current data processing equipment and applications.

The manufacturers of equipment are giving wholehearted support to these schools, colleges and institutes and have in some cases patterned their own internal training to operate at the level and along the lines of a university graduate school. In organizing, staffing and preparing the curriculum of these company sponsored institutes, the objective has been to set high standards of professional excellence.

One of the largest equipment manufacturers has just opened a Systems Research Institute for its own personnel which will be devoted to developing and teaching advanced methods of making a data processing study, defining a solution and operating the system, thus furthering the new profession of data processing systems engineering.

There are now so many educational opportunities that anyone can assure his security in this field by taking advantage of some phase of the broad offering available. ■

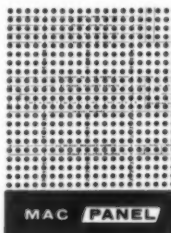


Stop back circuits with your own wires and a MAC Panel Filter Plug!



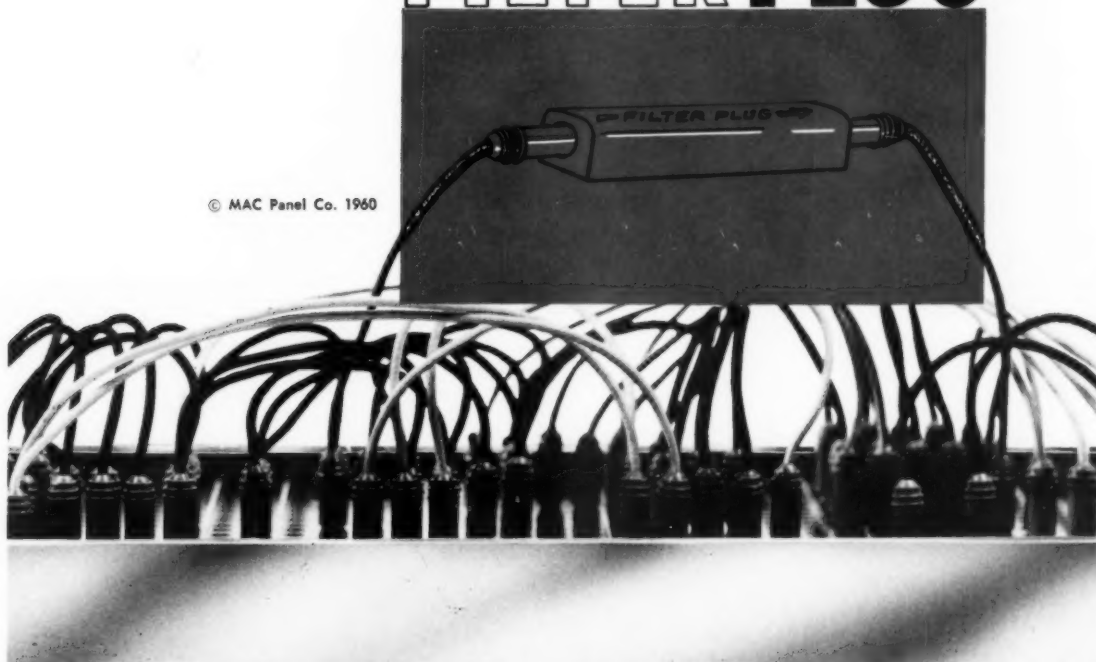
Now, another new MAC Panel product to solve your panel wiring problems . . . it's the compact **FILTER PLUG**, developed for use with *your wires* to stop back circuits by keeping current flowing in one direction. Designed and engineered to eliminate costly delays caused by wiring around back circuits, the **FILTER PLUG** can be used easily and swiftly with any length wires on hand. This eliminates having to stock extra quantities of various length wire-with-filter units. Your wires, plus MAC Panel **FILTER PLUGS**, mean greater flexibility in self-contacting panel wiring where back circuits occur.

MAC PANEL CO. High Point, No. Carolina



FILTER PLUG

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20 DRAWER
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CAPACITY
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(80,250 cards)

PRICE			
Without lock	Cat. #1375-11	\$169.50	
With lock	Cat. #1375-12	\$178.50	

4 DRAWER
Three-Quarter Suspension
CAPACITY
107 filing inches
(16,050 cards)

PRICE			
Without lock	Cat. #1390-11	\$59.50	
With lock	Cat. #1390-12	\$66.50	

12 DRAWER
Three-Quarter Suspension
CAPACITY
231 filing inches
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PRICE			
Without lock	Cat. #1385-11	\$115.75	
With lock	Cat. #1385-12	\$123.75	

All new three-quarter and full suspension files, designed and built by the leaders in the data processing accessory equipment field. This line includes all the features our customers have asked for through the years. They are quality files, economically priced.

The tray which fits all files is the basic part of the new line. It gives positive compression, is light in weight and

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